

ISSN 0253-4924

FOOD TECHNOLOGY *Abstracts*

Vol. 29 No. 8 August 1994



**Central Food Technological Research Institute, Mysore
National Information System for Science and Technology
Department of Scientific and Industrial Research, New Delhi.**

NATIONAL INFORMATION CENTRE FOR FOOD SCIENCE AND TECHNOLOGY

CFTRI, MYSORE - 570 013

The National Information Centre for Food Science and Technology (NICFOS), is a discipline oriented information service in Food Science, Technology and Nutrition. Set up in October 1977 at the Central Food Technological Research Institute (CFTRI), Mysore, it is one of the Sectoral Information Centres under the NISSAT of the Govt. of India, Dept. of Scientific and Industrial Research.

NICFOS's services are generated by a band of professional specialists and backed up by reprographic, micrographic, printing and computer facility. Its services include publication of R & D and industry oriented current awareness services, answering technical inquiries, reprography and training.

NICFOS BASE

The well-equipped Library of CFTRI with its collection going back to 1950 functions as a clearing house for information on all aspects of food area. With its large collection of books, monographs, conference proceedings, bound volumes of periodicals, standards, patents, reports, theses, microforms and 600 current periodicals it can provide you with the latest information on any subject area of food. The library also serves as a training centre in different aspects of information handling and use besides guiding in setting up of new libraries in the area of food science and technology.

PHOTOCOPY (XEROX) OF PUBLISHED SCIENTIFIC/TECHNICAL ARTICLES

The National Information Centre for Food Science and Technology (NICFOS) at the Central Food Technological Research Institute, Mysore, has got a good collection of scientific and other periodicals collected over the years in the area of Biological Sciences. If any article is needed for reference work, we will supply one copy from our wealth of collections. The cost of providing the copies is Rs.2/- per page (minimum charge Rs.10.00). Please take advantage of this facility to overcome your problem in getting original articles.

All correspondences regarding these services should be addressed to:

*The Head
FOSTIS, CFTRI,
Mysore 570 013,
Karnataka, India.*

FOOD TECHNOLOGY ABSTRACTS

Vol. 29 No. 8
August 1994



National Information Centre For Food Science And Technology
Central Food Technological Research Institute,
Mysore - 570 013, India

Compiled and Edited by

B. Vasu

C. S. Anita

Geetha Seetharam

Abstractors to FTA

AA	Author's Abstract
BV	B. Vasu
CSA	C. S. Anita
GS	Geetha Seetharam
KAR	K. A. Ranganath
SD	S. Dhanaraj
SRA	S. R. Ananthnarayan
VKR	V. Krishnaswamy Rao

Computerisation and Database Creation

P. Manilal

C. S. Anita

B. Vasu

S. R. Ananthnarayan

Annual Subscription : Rs.300.00. US \$ 90.00. Single Copy : Rs.30.00

CONTENTS

	Page No
General	... 527
Food Processing	... 528
Food Packaging	... 528
Food Engineering and Equipment	... 529
Energy in Food Processing	... -
Food Chemistry and Analysis	... 530
Food Microbiology and Hygiene	... 530
Biotechnology	... 539
Tissue Culture	... -
Food Additives	... 540
Cereals	... 540
Millet	... 542
Pulses	... 543
Oilseeds and Nuts	... 544
Tubers and Vegetables	... 545
Fruits	... 548
Confectionery, Starch and Sugar	... 551
Bakery products	... 553
Milk and Dairy products	... 553
Meat and Poultry	... 556
Seafoods	... 562
Protein Foods	... 563
Alcoholic and Non-alcoholic Beverages	... 564
Fats and oils	... 566
Spices and Condiments	... 571
Sensory Evaluation	... 571
Food Storage	... -
Infestation Control and Pesticides	... -
Biochemistry and Nutrition	... 572
Toxicology	... -
Food Laws and Regulations	... 574
Author Index	... 575
Subject Index	... 581

ABBREVIATIONS

A	ampere
AAS	atomic absorption spectrometry
ADP	adenosine diphosphate
Anon.	Anonymous
AOAC	Association of Official Analytical Chemists
approx.	approximately
atm	atmosphere
ATP	adenosine triphosphate
a_w	water activity
BHA	butylated hydroxyanisole
BHT	butylated hydroxytoluene
b.p.	boiling point
Btu	British thermal unit
c-	centi- [as in cm, cm ² , cm ³]
cal	calorie
cd	candela
°C	degree centigrade
Cl	curie
CMC	carboxymethyl cellulose
coeff.	coefficient
conc.	concentrated
concn.	concentration
cv.	cultivar
cwt	hundredweight
d-	deci-
DE	dextrose equivalent
detn.	determination
DFD	dark firm dry
diam.	diameter
dil.	dilute
DM	dry matter
DNA	deoxyribonucleic acid(s)
dyn	dyne
E.	East, Eastern, etc
ECD.	electron capture detection
EDTA	ethylenediaminetetraacetic acid
Eh	oxidation-reduction potential
ELISA	enzyme-linked immunosorbent assay
f-	femto- [10 ⁻¹⁵ , as in fCl]
°F	degree Fahrenheit
FAO	Food and Agricultural Organization
FDA	Food and Drug Administration
FID	flame ionization detection
fl oz	fluid ounce
f.p.	freezing point
ft	foot, feet
g	gram
GC	gas chromatography

gr	gravity
gal	gallon
gf	gram-force
GLC	gas-liquid chromatography
h	hour
ha	hectare
HDPE	high density polyethylene
hl	hectolitre [100 l]
hp	horse power
HPLC	high performance/pressure liquid chromatography
HTST	high temperature short time
Hz	hertz [frequency cycles/s]
in	inch
IR	infrared
IU	international unit
J	Joule
k-	kilo- [as in kcal, kg]
K	Kelvin
l	litre
lb	pound
lbf	pound-force
LDPE	low density polyethylene
m-	milli- [as in mg, ml, mm]
m-	equimilli-equivalent
M	molar concentration
M-	mega- [as in Mrad]
max.	maximum
min	minute [time]
min.	minimum
mol	mole
mol.wt.	molecular weight
m.p.	melting point
MPN	most probable number
MS	mass-spectrometry
n-	nano- [10 ⁻⁹ , as in nm]
N	Newton [kg m/s ²]
N.	North, Northern, etc
N	Normal concentration
NMR	nuclear magnetic resonance
NPU	net protein utilization
oz	ounce
p-	pico- [10 ⁻¹² , as in pCl]
P	Poise
p	probability
Pa	pascal (N/M ²)
PAGE	polyacrylamide gel electrophoresis
PER	protein efficiency ratio
p.p.b.	parts per billion
p.p.m.	parts per million
PSE	pale soft exudative
PTFE	polytetrafluorethylene
PVC	polyvinyl chloride
PVDC	polyvinylidene chloride

qt	quart
R	rontgen
rad	rad or radian
ref.	reference(s)
rev/min	revolutions per minute
RH	relative humidity
RNA	ribonucleic acid(s)
S.	South, Southern, etc.
s.d.	standard deviation
SDS	sodium dodecylsulphate
s.e.	standard error
s	second [time]
SNF	solids-not-fat
sp., spp.	species
sp.gr.	specific gravity
summ.	summary
Suppl.	Supplement
t	metric tonne
temp.	temperature
TLC	thin layer chromatography
TS	total solids
UHT	ultra-high temperature
UV	ultraviolet
V	volt
var.	variety
vol.	volume
v/v	volume/volume
W	watt
W.	West, Western, etc.
WHO	World Health Organization
w/v	weight/volume
wk	week
wt.	weight
yd	yard
yr	year
μ	micro- [as in g, μm]
%	per centum
>	greater than
≥	greater than or equal to; not less than
<	less than
≤	less than or equal to; not greater than

ABBREVIATIONS FOR LANGUAGES

Language of text

Dutch	Nl
French	Fr
German	De
Italian	It
Japanese	Ja
Norwegian	No
Spanish	E
Swedish	Sv

GENERAL

1427

Sardana (V) and Vaidya (R). **Quality problems in agro industries: Challenges and approaches.** *Indian Food Packer* 48(4); 1994; 29-32

Basic concepts of quality, quality control and quality assurance; and their need and importance for food industries are discussed. Suitable solutions to problems of quality control in food industries in India are suggested. GS

1428

Friedman (M). **Prepared produce saves consumers valuable time.** *Prepared Foods* 162(6); 1993; 49

Fresh, processed products introduced onto the US market is discussed. Aspects discussed include: chopped, diced, washed, mixed and packaged products; ready salad blends; spinach salad mixes; prepared vegetables; vegetable coleslaws containing broccoli, red cabbage and carrots; baking potato packs for the microwave; prepared pineapple in pouches; prepared fruit salads; sun-dried products (tomatoes, cranberries and blueberries); and exotic trail mix. BV

1429

Davis (S). **New soup offerings are usin' the old noodle.** *Prepared Foods* 162(5); 1993; 105

New product introduced in the soups category in the US in 1992 are described. There were 54 newer items in this category in 1992. Aspects included: healthy-labelled soups; noodle-containing soups; soups with no added salt; and ethnically influenced soups. BV

1430

Dornblaser (L). **Processors up the ante on entree quality.** *Prepared Foods* 162(5); 1993; 83-84

New product introduce in the entrees category in the US are discussed. Aspects considered

include: pizza; cooked breakfast products; bottled dinner mixes; and dinners for children. BV

1431

Friedman (M). **Recession blues finally impact new products.** *Prepared Foods* 162(5); 1993; 44-45

The effect of the recession on the rate of new food product introduced onto the market in the US in 1992 is discussed. Total new food items introduced declined by 0.7% in 1992, following a 20% increase in 1991. Aspects discussed include: categories in which decline was reported; categories in which increases were reported; domination of line extensions; effect of labelling regulations on healthy claims; cluster brands; improved sales of private labels; speciality food introductions; increase in the condiment category; and calorie consumption. BV

1432

Friedman (M). **Gazing into the crystal ball for 1993.** *Prepared Foods* 162(5); 1993; 27-28

Predictions for new product introduced in the US market in 1993 are described. Aspects described include: food kits for those who enjoy making foods; ultra-concentrated products; do-it-yourself pizza toppings; fruit sauces to be used as fat/sugar substitutes in bakery products; vegetable juices; prepared salad mixes; fresh pasta sauces; cookies; biotechnologically derived potatoes; nutraceutical foods; antioxidant formulations; clear beverages; vegetarian products; tuna burgers; foods containing anticarcinogens; and foods adapted to FDA requirements. BV

1433

Lehrer (SB) and O'Neil (CE). **Occupational reactions in the food industry.** *Indian Food Industry* 12(4); 1993; 40-46

Food industry employees are exposed to a wide var. of substances and some of which can induce allergic reactions. Agents encountered in food-related industries (coffee) reported to induce occupational asthma (OA) is reported. Diagnosis, treatment of OA and coffee bean

hypersensitivity are the aspects considered. CSA

1434

Jayaraman (KS). **Some process technologies for the preparation of convenience foods from fruits and vegetables for defence services.** *Indian Food Industry* 12(5); 1993; 32-40

Some of the process technologies developed and used to prepare ready-to-eat or quickly reconstitutable convenience foods from fruits and vegetables for use by the Armed forces with ample scope for application in the civil sector are highlighted. Technologies described include dehydration of vegetables by a high temp. short time (HTST) pneumatic drying to bring about porosity and incorporation of additives like salt and sucrose by soak infusion to minimise shrinkage, quick-cooking vegetables curry (Avial) mix, intermediate moisture fruits and vegetables, fruit bars, spray-dried fruit flavoured milk, lassi-beverage powders and instant soup mixes. CSA

FOOD PROCESSING

1435

Decker (SJ). **Extraneous matter in food processing and storage.** *Dairy, Food and Environmental Sanitation* 14(1); 1994; 12-15

The significance of extraneous matter including classifications and federal regulations are discussed and analytical methods used for the detection of extraneous matter in food products is reviewed. Types of contaminants and their importance, regulatory enforcement (defect action levels), macroanalytical procedures (light filth procedures, hair identification) stored product pests - "insects", insect fragments and their identification are the aspects covered. 14 references. SRA

1436

Sankat (CK) and Maharaj (V). **Drying the green herb *Shado beni* (*Eryngium foetidum* L.) in a natural convection cabinet and solar driers.** *ASEAN Food Journal* 9(1); 1994; 17-23

The food flavouring herb '*Shado beni*' (*E. foetidum* L.) was dried in natural convection cabinet dryer at 35, 45, 55 and 65°C to determine its drying characteristics. Drying in the falling rate period was strongly temp. dependent with 2 drying periods adequately describing the drying behaviour. Drying constants were 0.064 h⁻¹, 0.265 h⁻¹, 0.0296 h⁻¹ and 0.782 h⁻¹ for the 1st falling rate period at all 4 temp. respectively. In 2 similar low cost, natural convection, solar driers of direct and indirect types operating at daily temp. of 39.5 and 37.6°C respectively, the herb's moisture content was reduced from an initial value of 8.55 - 9 and 20% for the direct and driers respectively, in 5 days. On drying, the volatile oil content of herb dropped from 0.84 - 0.12% for direct and 0.19% for direct driers. Blanching herb in hot water at 96°C, followed by drying in the indirect dryer reduced the loss of green colour, normally observed on drying without pre-treatment. Blanching did not affect the drying rate behaviour of the herb. SRA

FOOD PACKAGING

1437

Forcinio (H). **Great expectations: packaging technology meets today's multiple needs.** *Prepared Foods* 162(5); 1993; 32-34

The expanding role of food packs is discussed with respect to the increasing expectations. (packs must be convenient, retain freshness, be environmentally friendly, be easy to store, open and use, stand out, be cost effective, and handle efficiently on the production line) placed on their performance. Packaging developments of 1992 in the US are described with regard to these expectations. Aspects considered include: easy-open plastics ends (especially for children); product-visible packaging; bakeable film overwraps for biscuits; shrink wrap packs for premeasured foods; resealable serving bowls; and multilayer paper cups for microwaveable soups. BV

1438

Swientek (B). **Pumping up packaging line efficiencies.** *Prepared Foods* 162(4); 1993; 68-71

Increase of food packaging production capacity using emerging technologies and software tools is described. Aspects considered include: packaging line improvement; motion analysis systems for high-speed packaging lines; flexibility and automation of packaging lines; Japanese strategies (more capacity surplus is built into their packaging lines); simulation modelling (addressing dynamic interactions of a line's components and measuring overall system efficiency and control stability); and use of animation graphics to enhance visual understanding of process performance. BV

1439

Anon. **Environmentally correct '90s spur grocery package recycling.** *Prepared Foods* 162(3); 1993; 87-88

Trends in the recycling of grocery packaging are discussed with respect to a survey conducted from 1980 to 1990. Aspects considered include: highlights of the study; recycling centres; barriers to recycling; FDA guidance document for recycling materials; US recycling regulations; and trends in global recycling. BV

FOOD ENGINEERING AND EQUIPMENT

1440

Radha Charan, Arup Dutta and Mathur (S). **Specific heat of some liquid foods.** *Beverage and Food World* 21(4); 1994; 9-10, 12

This paper presents the method of sp. heat (SH) detn. by law of cooling apparatus and also deals with the effect of total solids (TS) on SH of liquid foods (cow milk (CM), toned milk (TM), orange juice (OJ) and sugarcane juice (SCJ)). The Av. initial TS of CM, TM, OJ and SCJ were 13, 11, 13 and 8% respectively. The av. SH of CM varied from 0.9 - 0.787 kcal/kg^oC, when the TS varied from 13 - 26%. The av. SH of TM varied from 0.92-0.76 kcal/kg^oC, when TS varied from 11 - 28%. Similarly the av. SH of OJ and SCJ varied from 0.89 and 0.83 kcal/kg^oC - 0.79 and 0.73 kcal/kg^oC when the TS varied from 13 and 8 to 35 and 36% respectively. SRA

1441

Kim (Y-H), Nelson (JT) and Glynn (AB). **Meso-scale modelling of polymers and its applications in food technology.** *Cereal Foods World* 39(1); 1994; 8-16, 18

Presents a general discussion of computer simulation and its uses, as well as a description of the unique features of meso-scale modeling for solving polymer problems in food science and technology. CSA

1442

Pruthi (JS). **Quick frozen food industries - a global overview.** *Indian Food Packer* 48(3); 1994; 47-58

Frozen seafoods occupy the top rank followed by ready-to-serve meals, vegetable and poultry. Based on a market research survey, production, consumption and international trade of quick frozen foods in developed countries like USA, Austria, Belgium, Denmark, Finland, France, Germany, Great Britain, Italy, Netherlands, Norway, Spain, Sweden, Switzerland, Japan, Thailand, Hongkong, Singapore, Chile and India are reviewed. GS

1443

Swientek (B). **Robotics: get a grip on it.** *Prepared Foods* 162(6); 1993; 80-82, 84

Discusses the use of robotic systems to build flexibility into existing food manufacturing operations, which can react quickly to fast-changing market conditions. Aspects discussed include: flexibility of the use of robotics in food manufacturing; automation; advances in robotics and related technology; use of robotics to eliminate the need for exposing workers to repetitive motion tasks and harsh environments; equipment selection; and use of robotic applications in food palletizing operations. BV

1444

O'Donnell (CD). **The formulation challenge. Formulating for the big freeze.** *Prepared Foods* 162(6); 1993; 55-56

Discusses the development of frozen foods which have the characteristics of fresh foods.

with respect to the use of additional ingredients that function within the framework of freezing technologies. Aspects discussed include: effects of freeze concn. and frozen storage on quality; importance of the glassy state; formulation of foods with enhanced stability to freezing (by altering ingredients, altering glass transition temp.); and use of antioxidants and barrier films. BV

1445

Hingorani (NA). **Scope of supercritical fluid extraction technology in India.** *Indian Food Industry* 12(5); 1993; 30-31, 40

Aspects described in this article are CO₂ as supercritical fluid (SCF), application of SCF extraction in food processing and other industries, advantages of SCF with CO₂ process compared to conventional solvent extraction process, manufacturers of SCF extraction plant, status of R and D in India - SCF technology and scope of SCF extraction technology in India. CSA

ENERGY IN FOOD PROCESSING

Nil

FOOD CHEMISTRY AND ANALYSIS

Chemistry

1446

Jinap (S). **Organic acids in cocoa beans - a review.** *ASEAN Food Journal* 9(1); 1994; 3-12

Cocoa beans contain about 0.47 - 1.02% volatile acids (acetic, propionic, butyric, isobutyric and isovaleric) and 1.01 - 1.88% nonvolatile acids (oxalic, citric, malic, succinic, lactic and tartaric). Aspects covered are: occurrence of acids; acid development during post-harvest, fermentation, roasting, conching; contribution of acid to flavour and acids responsible for acidic taste. SRA

Chemistry (analytical)

1447

Yamada (S), Noda (N), Mikami (E) and Hayakawa (J). **Analysis of natural coloring matter in food. 4. Methylation of cochineal color with diazomethane for the analysis of food products.** *Journal of Agricultural and Food Chemistry* 41(7); 1993; 1071-1075

A TLC method for detecting cochineal involving methylation with ethereal in tetrahydrofuran was developed. 65 foods samples (including candy, fruit juice, jelly, ice cream, steamed rice cakes, loin ham and Vienna sausage) were analysed for cochineal using the TLC method with cleanup on a Sep-Pak C18 cartridge. Using chloroform:methanol:water (65:35:10) as mobile phase, all methylated cochineal preparations gave a reddish orange spot at R_f 0.75. The compound with R_f 0.75 was identified as 3,6-di-O-methylcarminic acid methyl ester. Cochineal was detected in 23 of the foods analysed. BV

FOOD MICROBIOLOGY AND HYGIENE

1448

Hahnau (S) and Weiler (EW). **Monoclonal antibodies for the enzyme immunoassay of the mycotoxin cyclopiazonic acid.** *Journal of Agricultural and Food Chemistry* 41(7); 1993; 1076-1080

Murine monoclonal antibodies (MAB) were raised from hybridomas obtained by fusions of splenocytes from Balb/c mice immunized intraperitoneally with cyclopiazonic acid-keyhole limpet haemocyanin (CPA-KLH) conjugates, with different myeloma lines. Hybridomas secreting antibodies against CPA were detected by enzyme immunoassay, purified by limiting dilution cloning and adapted to a batch fermentation process for the large-scale production of MAB. From 15 independent hybridomas obtained, 1 was used further. MAB S14-2-B6 (IgG1) was extremely selective for cyclopiazonic acid (the only cross-reactant detected was cyclopiazonic acid imine, which had a cross-reaction of 20%) and could be used in an antibody-immobilized enzyme immunoassay format measuring 7-300 ng mycotoxin per assay. The intra-assay coeff. of variation is 2.5%, and inter-assay variability

is 4.4% (within-day) and 8.1% (between-day). Crude extracts from fungal strains were analysed for CPA, allowing screening of fungal isolates for toxin production. The assay can be used to analyse white-mould fermented cheese for CPA. AA

1449

Schoeller (C), Chaudhuri (JB) and Pyle (DL). **Emulsion liquid membrane extraction of lactic acid from aqueous solutions and fermentation broth.** *Biotechnology and Bioengineering* 42(1); 1993; 50-58

Studies on the batch extraction of lactic acid using an emulsion liquid membrane system are reported. The membrane phase consists of the tertiary amine carrier Alamine 336 and the surfactant Span 80 dissolved in *n*-heptane/paraffin and aqueous solutions of sodium carbonate in the internal phase. The effects of internal phase reagent, extraction temp. and initial external phase pH on extraction efficiency and emulsion swelling were examined. A statistical factorial experiment on extraction of lactic acid from clarified [*Lactobacillus delbrueckii*] fermentation broth was carried out. The extraction efficiency from the fermentation broth was lower when compared to aqueous solutions of pure lactic acid. The effect of pH and the presence of other ionic species on selectivity are discussed. AA

Enzymes

1450

Lee (KH), Lee (PM) and Siaw (YS). **Immobilization of aminoacylase by encapsulation in poly-L-lysine-stabilized calcium alginate beads.** *Journal of Chemical Technology and Biotechnology* 57(1); 1993; 27-32

Aminoacylase I (EC 3.5.1.14) (*Aspergillus aminocylases*) encapsulated in calcium alginate beads stabilized with poly-L-lysine was used for the production of L-phenylalanine [a precursor of aspartame] by the hydrolysis of a racemic mixture of N-acetyl-DI-phenylalanine. The immobilized aminoacylase was studied with respect to operational stability, thermal stability, effects of pH and temp. and kinetic

constants. Leakage of enzyme from the stabilized beads was eliminated. The immobilized enzyme retained high biological activity. K_m and V_{max} values for stabilized beads were $11.11 \text{ mmol dm}^{-3}$ and $0.076 \text{ } \mu\text{mol min}^{-1}$, respectively. Optimum pH and temp. for hydrolysis were 6.5 and 55°C , respectively. SEM revealed crosslinked structures on the surface of beads. Operational performances of the beads in a batch reaction and a packed-bed bioreactor for continuous reaction were investigated. With batch reaction, only about 5% of enzyme activity was lost within 10 reaction cycles and there was no significant loss of activity over 600 h of continuous operation after equilibrium was reached, and a conversion yield of about 80% was obtained. BV

1451

Stevenson (DE), Stanley (RA) and Furneaux (RH). **Optimization of alkyl β -D-galactopyranoside synthesis from lactose using commercially available β -galactosidases.** *Biotechnology and Bioengineering* 42(5); 1993; 657-666

Commercially available lactase (β -D-galactoside galactohydrolase, EC 3.2.1.23) enzymes from *Kluyveromyces fragilis* and *K. lactis* were used as catalysts for the production of β -galactopyranosides of various alcohols using lactose as galactosyl donor. Galactoside yields were enhanced by using the highest practical concn. of both lactose and alcohol acceptor. Concn. and thus yield, were limited by solubility of substrates. The increase in galactoside yield with increasing lactose concn. was specific to the lactose substrate and not due to aw alterations. The galactoside yield peaked after 70-80% of the lactose was consumed, due to hydrolysis of the product by the enzyme. A number of compounds with primary or secondary hydroxyl groups could act as acceptors, the essential requirement being at least some water solubility. Addition of organic cosolvents had little effect on galactoside yield except when it increased the water solubility of sparingly soluble alcohols. Some galactosides were synthesized on a gram scale to determine practical product recoveries and improve purification methods for large-scale synthesis. Initial purification by hydrophobic chromatography (for galactosides

of hydrophobic alcohols) or strong anion-exchange chromatography (for galactosides of hydrophilic alcohols) separated galactosides, galactobiosides and higher oligomers from reducing sugars. A facile separation of the galactoside and galactobioside could then be effected by flash chromatography on silica gel. AA

Pectinlyase

1452

Spagna (G), Pifferi (PG) and Martino (A). **Pectinlyase immobilization on epoxy supports for application in the food processing industry.** *Journal of Chemical Technology and Biotechnology* 57(4); 1993; 379-385

Immobilization of a pectin lyase (PL, EC 4.2.2.3) purified from a commercial enzyme preparation was studied with respect to its use for fruit pulp and juice processing. 2 epoxy supports were tested for immobilization, Eupergit C (Rohm), a synthetic polymer, and γ -alumina functionalized with γ -glycidoxypolytrimethoxysilane. For both immobilized biocatalysts, catalytic response was low. The highest response in terms of immobilization yield and immobilized PL activity was observed for Eupergit C (approx. 115 unit g^{-1} at optimum pH). AA

Microorganisms

Bacteria

1453

Ibrahim (HR), Kobayashi (K) and Kato (A). **Length of hydrocarbon chain and antimicrobial action to Gram-negative bacteria of fatty acylated lysozyme.** *Journal of Agricultural and Food Chemistry* 41(7); 1993; 1164-1168

Lysozyme can be converted into a potent bactericidal protein against *Escherichia coli* by covalent attachment of 1 or 2 palmitic acids to its lysyl residues. Antimicrobial behaviour against *E. coli* K-12 3301 of lysozyme [hen egg white] covalently modified with myristic and stearic acids was studied to determine the

effect of each type of fatty acid on the bactericidal action of lysozyme. All types of attached fatty acids, including palmitic acid, were able to transform lysozyme into a molecule bactericidal against *E. coli*, depending on the length and number of each type of fatty acid. Among the monoacylated lysozyme derivatives, the longer the C chain of the attached fatty acid, the more potent the bactericidal lysozyme type. Among the diacylated lysozyme derivatives, palmitoylated lysozyme was the most potent bactericidal agent. The binding capacity of purified *E. coli* lipopolysaccharide to the most potent bactericidal acylated lysozymes was stronger than to nonmodified lysozyme, whereas myristoylated lysozyme exhibited the strongest affinity. Results indicate that the bactericidal activity of modified lysozymes could be attributed to their moderately enhanced membrane fusion capabilities. AA

1454

Hanlin (MB), Kalchayanand (N), Ray (P) and Ray (B). **Bacteriocins of lactic acid bacteria in combination have greater antibacterial activity.** *Journal of Food Protection* 56(3); 1993; 252-255

Antibacterial efficiency of two bacteriocins from lactic acid bacteria, pediocin AcH and nisin, was tested individually and in combination against several Gram-positive bacterial strains including some involved in food spoilage and foodborne diseases [*Lactobacillus plantarum* NCDO 955, *Leuconostoc mesenteroides* Ly, *Pediococcus acidilactici* LB-42, *Enterococcus faecalis* MB1 and *Listeria monocytogenes* strains CA and Scott A]. Antibacterial activity of pediocin AcH and nisin was enhanced when they were in combination. The principles of this greater antibacterial spectrum have been proposed. Bacteriocins in combinations can be used to design efficient natural food biopreservative(s). AA

1455

Vermue (M), Sikkema (J), Verheul (A), Bakker (R) and Tramper (J). **Toxicity of homologous series of organic solvents for the Gram-positive bacteria *Arthrobacter* and *Nocardia* sp. and the Gram-negative bacteria *Acinetobacter* and *Pseudomonas***

Bacillus cereus

1456

Nanimori (T), Nagai (M), Shimizu (Y), Shinke (R) and Mikami (B). **Cloning of the beta-amylase gene from *Bacillus cereus* and characteristics of the primary structure of the enzyme.** *Applied and Environmental Microbiology* 59(2); 1993; 623-627

The gene encoding the β -amylase of *Bacillus cereus* BQ10-S1 (Spoll) was cloned into *Escherichia coli* JM 109. A sequenced DNA fragment of 2001 bp contained the β -amylase gene. The N-terminal sequences, the C-terminal sequences and the amino acid sequences of the 5 regions of the β -amylase molecules were determined. Mature β -amylase contains 514 amino acid residues with a molecular mass of 57 885 Da. Amino acid sequence homology with those of known β -amylases was 52.7% for *Bacillus polymyxa*, 52.0% for *Bacillus circulans*, 43.4% for *Clostridium thermosulfurogenes*, 31.8% for *Arabidopsis thaliana*, 31.5% for barley, 29.9% for sweet potato and 28.9% for soybean. 10 well-conserved regions were found between the N terminus and the area around residue 430, but the C-terminal region of 90 residues has no similarity with those of plant β -amylases. The C-terminal region has homology with C-terminal regions of β -amylase from *C. thermosulfurogenes*, some bacterial α -amylases, cyclodextrin glucanotransferase and glucoamylase. Some of these sequences are known as the raw-starch-binding domain. Results suggest that *B. cereus* β -amylase has an extra domain which has raw-starch-binding ability and that the domain has considerable sequence homology with those of other amylases or related enzymes from a wide variety of microorganisms. AA

Bacillus polymyxa

1457

Pinaga (F), Pena (JL) and Valles (S). **Xylanase production by *Bacillus polymyxa*.** *Journal of Chemical Technology and Biotechnology* 57(4); 1993; 327-333

Bacillus polymyxa [CECT 153] produced high levels ($12\text{--}13\text{ U cm}^{-3}$) of extracellular xylanases [1,4- β -D-xylan xylanohydrolases; EC 3.2.1.8] when grown in a complex medium containing yeast extract and oat spelt xylan as N and C sources, respectively. Substantially lower yields of enzyme were produced during growth on glucose, arabinose and xylose. Meagre growth was reduced when ammonium sulphate, instead of yeast extract was used as N source. When assayed in culture broth supernatants, xylanase showed an optimum activity at 48°C and at pH values in the range 5.0-6.5. Under such conditions, the half-life of this xylanase preparation was 8 h. Mn^{2+} strongly inhibited the enzyme, and inhibition by EDTA (27% w/v) suggested dependence on a metallic ion. SDS-PAGE and zymogram overlay showed that up to 5 separate xylanases in the range of 20 to 116 kDa were produced. AA

Bacillus subtilis

1458

Anon. **Food trend favors 'can-do' enzymes.** *Prepared Foods* 162(3); 1993; 77

A food grade proteolytic enzyme derived from *Bacillus subtilis* is described which can be used as an alternative to sulphites for conditioning dough. The enzyme, HT-Proteolytic L-175, acts on the peptide bonds of gluten proteins, softening the dough for improved extensibility with reduced elasticity. It is useful for conditioning high-protein flours in crackers, cookies, pizza and other speciality bakery products. BV

Corynebacterium glutamicum

1459

Kwong (SCW), Randers (L) and Rao (G). **On-line detection of substrate exhaustion by using NAD(P)H fluorescence.** *Applied and Environmental Microbiology* 59(2); 1993; 604-606

The utility of NAD(P)H fluorescence for monitoring aerobic fermentations of the threonine auxotroph *Corynebacterium*

glutamicum ATCC 14296 was examined. It was possible to use the information contained in the on-line NAD(P)H fluorescence signal to assess culture metabolic activities during fermentation. The first derivative of the filtered fluorescence signal, which approximates the turnover rate of the NAD(P)H pool, could be used to precisely identify the temporal points of threonine and glucose exhaustion. AA

Escherichia coli

1460

Best (D). **Solution near on *E. coli* crisis.** *Prepared Foods* 162(4); 1993; 41-42

Research currently being undertaken on control methods for *Escherichia coli* O157:H7 in foods is described. Aspects considered include: development of an integrated HACCP program for the meat industry; development of an *E. coli* rapid-detection kit that uses a highly selective antibody to the O157:H7 strain; controlling animal hygiene, pre- and post-slaughter; heat sensitivity of *E. coli* O157:H7; and areas where problems may occur (e.g. hamburgers). BV

Lactococcus

1461

Fitzgerald (G), Coffey (A) and Daly (C). **Molecular manipulations of *Lactococcus* starter cultures for food fermentations.** *Journal of Chemical Technology and Biotechnology* 58(2); 1993; 195-199

Lactococcus spp. are of great importance in starter cultures for food fermentations, particularly for dairy products but also for other foods (meat and vegetables). Genetic manipulation of *Lactococcus* has been intensively studied with the aim of producing strains with superior or novel fermentation characteristics. Recent developments in the molecular biology of lactococci are described. Aspects covered are plasmid biology; gene transfer; gene cloning; lactose metabolism; proteolytic activity; and bacteriophage resistance. BV

Lactococcus cremoris

1462

Benthin (S), Nielsen (J) and Villadsen (J). **Transport of sugars via two anomer-specific sites on mannose-phosphotransferase system in *Lactococcus cremoris*: in vivo study of mechanism, kinetics, and adaptation.** *Biotechnology and Bioengineering* 42(4); 1993; 440-448

Glucose uptake in *Lactococcus lactis* subsp. *cremoris* FDI occurs via the mannose phosphotransferase system (Man-PTS), which is quite unspecific and allows transport of many different sugars and sugar analogues. The existence of anomer-specific sites on Man-PTS was shown by experiments where α -glucose, β -glucose, mannose and 2-deoxyglucose were added to glucose-limited chemostat cultures. A quantitative description of the competitive uptake of these sugars at the 2 sites [the α -site and the β -site] is given. The adaptation of the flux distribution between the α - and β -site is tentatively explained by the hypothesis that 2 integral membrane proteins of Man-PTS are involved in this process. AA

Lactococcus Lactis

1463

Sing (WD) and Klaenhammer (TR). **A strategy for rotation of different bacteriophage defenses in a lactococcal single-strain starter culture system.** *Applied and Environmental Microbiology* 59(2); 1993; 365-372

A new strategy for starter culture rotations was developed for a series of phage-resistant clones genetically derived from a single strain of *Lactococcus lactis* subsp. *lactis*. Phage-resistant derivatives carrying different defense systems were constructed via conjugation with various plasmids encoding abortive infection (Abi/Hsp) and/or restriction and modification (R/M) systems of different specificity. Plasmids included pTR2030 (Hsp⁺ R⁺/M⁺), pTN20 (Abi⁺ R⁺/M⁺), pTRK11 (R⁺/M⁺) and pTRK68 (R⁺/M⁺). Selected phage-resistant transconjugants or transformants were evaluated in different rotation sequences through cycles of the Heap-Lawrence starter culture activity test in milk contaminated with

phage and whey from the previous cycle. Heap-Lawrence starter culture activity test in milk contaminated with phage and whey from the previous cycle. When used in consecutive sequence, derivative strains carrying the R/M systems encoded by pTN20, pTRK11 and pTRK68 retarded phage development when the initial levels of phage contamination were $< 10^2$ pfu/ml but not when levels were increased to 10^3 pfu/ml. Use of a derivative bearing pTR2030 (Hsp⁺ R⁺/M⁺) contamination were high (10^6 pfu/ml). Alternating the type and specificity of R/M and Abi defences through the rotation prevented phage proliferation and in some cases eliminated contaminating phages. A model rotation sequence for the phage defence rotation strategy was developed and performed successfully over 9 cycles of the Heap-Lawrence starter culture activity test in the presence of high-titre commercial phage composites. This phage defence rotation strategy is designed to protect a highly specialized *Lactococcus* strain from phage attack during continuous and extended use in the dairy industry. AA

Lactococcus lactis

1464

Kiewiet (R), Kok (J), Seegers (JFML), Venema (G) and Bron (S). **The mode of replication is a major factor in segregational plasmid instability in *Lactococcus lactis*.** *Applied and Environmental Microbiology* 59(2); 1993; 358-364

Effects of rolling-circle and theta modes of replication on the maintenance of recombinant plasmids in *Lact. lactis* were studied. Heterologous *Escherichia coli* or bacteriophage lambda DNA fragments of various sizes were inserted into vectors based on either the rolling-circle-type plasmid pWV01 or the theta-type plasmid pAMBetal. All pAMBetal derivatives were stably maintained. pWV01 derivatives, however, showed size-dependent segregational instability, in particular when larger DNA fragments were inserted. All recombinant pWV01 derivatives generated high-mol.-wt. plasmid multimers (HMW) in amounts that were positively correlated with plasmid size and inversely correlated with copy numbers of monomeric plasmid forms. Formation of HMW or reductions in copy

numbers were not observed with pAMBetal derivatives. Results indicate that HMW formation and/or reduction in plasmid copy numbers is an important factor in the maintenance of pWV01 derivatives. It is concluded that theta-type plasmids are superior to rolling-circle-type plasmids for cloning in lactococci. AA

Listeria

1465

O'Donnell (CD). **Solving salad bar *Listeria*.** *Prepared Foods* 162(6); 1993; 45-46

Microbial control of foods is discussed with respect to microbial food poisoning. Aspects covered include: advances in analytical techniques; *Listeria monocytogenes* monitoring; use of barrier chemicals to prevent bacterial growth; and health advantages of dairy cultures. BV

1466

Estela (LA) and Sofos (JN). **Comparison of conventional and reversed phage typing procedures for identification of *Listeria* spp.** *Applied and Environmental Microbiology* 59(2); 1993; 617-619

1467

Facinelli (B), Roberts (MC), Giovanetti (E), Casolari (C), Fabio (U), Varaldo (PE). **Genetic basis of tetracycline resistance in food-borne isolates of *Listeria innocua*.** *Applied and Environmental Microbiology* 59(2); 1993; 614-616

Eleven of 12 tetracycline-resistant *L. innocua* strains, isolated from chicken or turkey frankfurters and Mozzarella cheese, were shown to carry DNA sequences which hybridized with the Tet M probe; of these, 2 strains also hybridized with Tet K. The remaining strain hybridized with the Tet K probe only. The Tet M determinant appeared to be located on the chromosome; in one case, it was transferable by conjugation to recipient *L. monocytogenes*, *L. ivanovii* and *Enterococcus faecalis*. AA

Pseudomonas aeruginosa

1468

Lee (KH), Lee (PM), Siaw (YS) and Morihara (K). **Kinetics of aspartame precursor synthesis catalysed by *Pseudomonas aeruginosa* elastase.** *Journal of Chemical Technology and Biotechnology* 56(4); 1993; 375-381

The elastase (proteinase), isolated from *Ps. aeruginosa* IFO 3455, catalysed the synthesis of N-benzyloxycarbonyl-aspartyl-phenylalanine methyl ester, the precursor of the dipeptide sweetener, (aspartame). The influence of methanol as a cosolvent in this synthetic reaction was investigated. Synthesis of the dipeptide precursor was most efficient in 25% (v/v) methanol, pH 7.0 at about 25°C for a reaction time of about 3 h. Activity of the enzyme was greatly reduced in 90% methanol. Values of K and K_2 for N-benzyloxycarbonyl-aspartic acid were 0.17 mol dm^{-3} and $11.9 \text{ mol dm}^{-3} \text{ s}^{-1}$, respectively. BV

Shigella flexneri

1469

Islam (MS), Hasan (MK) and Khan (SI). **Growth and survival of *Shigella flexneri* in common Bangladeshi foods under various conditions of time and temperature.** *Applied and Environmental Microbiology* 59(2); 1993; 652-654

Survival and growth of *Shigella flexneri* were assessed in various foods (boiled rice, lentil soup, milk, cooked beef, cooked fish, mashed potato, mashed brinjal and raw cucumber). Growth at 25 and 37°C and survival at 5°C were observed by viable counts on MacConkey agar. The organism grew well in all tested foods and growth increased from 10^5 to 10^8 to 10^{10} cells/ml or g within 6 to 18 h after inoculation at 25 and 37°C. BV

Streptomyces thermoviolaceus

1470

Tsujibo (H), Minoura (K), Miyamoto (K), Endo (H), Moriwaki (M), Inamori (Y). **Purification and properties of a thermostable chitinase**

from *Streptomyces thermoviolaceus* OPC-520. *Applied and Environmental Microbiology* 59(2); 1993; 620-622

A chitinase (EC 3.2.1.14) was purified from culture filtrate of *Streptomyces thermoviolaceus* OPC-520. The enzyme showed a high optimum temp. (70-80°C), a high optimum pH level (8.0-10.0), and heat stability. The enzyme showed high sequence homology with chitinases from *Serratia marcescens* QMB1466 and *Bacillus circulans* WL-12. AA

Fungi

1471

Schnuerer (J). **Comparison of methods for estimating the biomass of three food-borne fungi with different growth patterns.** *Applied and Environmental Microbiology* 59(2); 1993; 552-555

To evaluate the effectiveness of steps taken to reduce the growth of fungi in food and feed, methods that can accurately quantify the degree of fungal contamination of solid substrates are needed. The ergosterol assay was evaluated by comparing results of this assay with spore counts and hyphal length measurements made with a microscope and with cfu counts. 3 fungi with different growth patterns during cultivation on a synthetic agar substrate were used. For the nonsporulating *Fusarium culmorum*, there was good agreement between changes in hyphal length, cfu and ergosterol content. *Penicillium rugulosum* and *Rhizopus stolonifer* produced many spores, and production of spores coincided with large increases in cfu but not with increases in hyphal length or ergosterol content. Spores constituted between 3 and 5% of total fungal mass. Changes in ergosterol level were closely related to changes in hyphal length. It was concluded that ergosterol level is a suitable marker for use in quantitatively monitoring fungal growth in solid substrates. AA

Aspergillus aminoacylases

1472

Lee (PM), Lee (KH) and Siaw (YS). **Covalent immobilization of aminoacylase to alginate**

for L-phenylalanine production. *Journal of Chemical Technology and Biotechnology* 58(1); 1993; 65-70

Aminoacylase I (EC 3.5.1.14) [from *Aspergillus*] was immobilized by covalent crosslinking to alginate molecules with 1-ethyl-3-(3-dimethyl-aminopropyl)-carbodiimide HCl followed by calcium alginate bead formation. The immobilized enzyme was used for the production of L-phenylalanine from racemic mixtures of N-acetyl-DL-phenylalanine. Different concn. of coupling reagent were tested and the coupling process was optimized. Immobilized and partially purified aminoacylase was characterized in terms of activity, operational stability, thermal stability, pH and temp. optima and kinetic constants, K_m and V_{max} . The activity of the enzyme covalently immobilized in calcium alginate beads was enhanced by about 75% compared to that of free enzyme. The beads were stable under operational conditions; they lost about 40% of their activity after 4 reaction cycles. Immobilized aminoacylase was stable over a broader pH range. It is concluded that this simple method provides irreversible immobilization of aminoacylase to give a biocatalyst with good operational stability and enhanced activity. AA

Mushrooms

1473

Geetha (D) and Sivaprakasam (K). ***Pleurotus djamor* - a new edible mushroom.** *Current Science* 64(5); 1993; 280-281

Pleurotus djamor (Fr.) Boedijn was collected for the first time in 1991 from Oil palm bunch wastes. Fungus was isolated, grain spawn prepared and the mushroom was cultivated on sterilized wastes - soaked paddy straw in poly-bags (45 x 30 cm) at 30 to 32°C and RH 70 to 90%. Yield of mushroom was 399 g from 150 g of spawn grown in a bed of 2.5 kg of sterilized water-soaked straw and the biological efficiency is 80%. KAR

1474

Castle (L). **Determination of acrylamide monomer in mushrooms grown on**

polyacrylamide gel. *Journal of Agricultural and Food Chemistry* 41(8); 1993; 1261-1263

Mushrooms (*Agaricus bisporus*) grown on a casing mixture containing polyacrylamide gel were analysed to assess possible uptake of acrylamide monomer from the polymer gel to the fruit during cultivation. The polymer contained 220 mg/kg residual monomer. At the application rate employed for cultivation this would give an initial monomer level of 220 µg/kg in the casing mix. Mushrooms were analysed by extraction, bromination and quantification of acrylamide as 2-bromopropenamide using GC-MS in selected ion mode. No acrylamide monomer could be detected at a limit of detection of 0.5 µg/kg. This demonstrates that acrylamide either does not translocate significantly from the mycelia to the mushroom fruit or that the monomer does not bioaccumulate, due perhaps to a high water solubility or chemical reactivity. AA

1475

Smith (ML), Taylor (HW) and Sharma (HD). **Comparison of the post-Chernobyl ¹³⁷Cs contamination of mushrooms from eastern Europe, Sweden, and North America.** *Applied and Environmental Microbiology* 59(1); 1993; 134-139

Rhizopus oligosporus

1476

Sargantanis (J), Karim (MN), Murphy (VG), Ryoo (D) and Tengerdy (RP). **Effect of operating conditions on solid substrate fermentation.** *Biotechnology and Bioengineering* 42(2); 1993; 149-158

The effects of environmental parameters on solid substrate fermentation (SSF) of *Rhizopus oligosporus* for protein production were studied. Parameters were air flow rate, inlet air RH, inlet air temp. and heat transfer coeff. between the outer wall of the fermentor and the air in the incubator. The air flow was supplied to effect cooling of the fermented mass by evaporation of water. A dynamic model was developed, which permitted estimation of biomass content, total dry matter, moisture content, and temp. of fermented matter. The model included the effects of temp. and

moisture content on max. specific growth rate and max. attainable biomass content. Results of the simulation showed good agreement with experimental data. Results also indicated that evaporative cooling of the biomass was very effective for temp. control and air flow rate and heat transfer coeff. had strong effects but they affected the biomass morphology and were not easily controllable. A simple technique for detn. of optimum temp. and content profile for cell protein production was applied. The simulated biomass production increased considerably employing the optimum temp. and moisture content profiles. BV

Yeasts

1477

Saigal (D). **Yeast strain development for ethanol production.** *Indian Journal of Microbiology* 33(3); 1993; 159-168

Techniques to improve the efficiency of industrial yeast strains in the production of ethanol such as broadened substrate specificity, increased fermentation efficiency, greater ethanol, osmo and temp. tolerance and appropriate sedimentation characteristics are reviewed. Popular techniques are hybridization, protoplast fusion, transformation, liposome mediated transfer, rare mating, mutation and spheroplast fusion are dealt with. GS

Schizosaccharomyces pombe

1478

Uribelarrea (JL), Queiroz (H-de), Goma (G) and Pareilleux (A). **Carbon and energy balances in cell-recycle cultures of Schizosaccharomyces pombe.** *Biotechnology and Bioengineering* 42(6); 1993; 729-736

Schizosaccharomyces pombe was aerobically grown in a cell-recycle fermentor under various operating conditions, i.e., different bleeding rates and various separate feed rates of glucose and basal medium. C and energy balances were analysed during steady-state culture regimes, allowing growth yields and maintenance coeff. to be determined under glucose-limited and glucose-excess environments. Special attention was given to the metabolic shift from

purely oxidative to respirofermentative glucose catabolism resulting from a change in the growth-limiting factor. No maintenance requirements for the C source and for energy were observed during glucose-limited culture regimes and oxidative catabolism. Under glucose excess and respirofermentative metabolism, the m_G coeff. was growth-linked, whereas enhancement of the apparent m_m coeff. observed for increased residual glucose concn. could be assigned to a decline in the ATP yield. AA

Zygosaccharomyces bailii

1479

Erickson (JP). **Hydrophobic membrane filtration method for the selective recovery and differentiation of Zygosaccharomyces bailii in acidified ingredients.** *Journal of Food Protection* 56(3); 1993; 234-238

A single-step enumeration and identification pour plate medium was developed for *Z. bailii* that totally inhibited environmental nonspoilage yeast and fungal growth and supported high (93.9-97%) *Z. bailii* recovery rates. It consisted of Sabouraud dextrose agar supplemented with fructose (3%), tryptone (0.5%), trypan blue (0.025%) and yeast extract (0.25%) to stimulate *Z. bailii* growth rate. Selectivity was based on the synergistic combination of NaCl (2.5%), acetic acid (0.5%) and potassium sorbate (0.01%). The recovery efficiency and specificity of the medium were significantly improved when it was adapted to the Hydrophobic Grid Membrane Filtration surface plating procedure. Incubation time was reduced from 5 to 2-3 days, and *Z. bailii* was visually differentiated from oxidative, acetic acid tolerant yeasts (*Hansenula* and *Pichia* spp.) by surface colony morphology. The optimized method assisted in successfully identifying and correcting *Z. bailii* contamination problems in acidified ingredients including pickled vegetables and pasteurized fruit juice concentrates. AA

Zymomonas mobilis

1480

Kaur (R), Gupta (RP), Sedha (RK), Neelam (V) and Pandher (MS). **Optimization of**

fermentation conditions for ethanol production using immobilized and free cells of *Zymomonas mobilis* ATCC 10988. *Indian Journal of Microbiology* 33(3); 1993; 169-173

Zymomonas mobilis ATCC 10988 cells were immobilized in sodium alginate, k-carrageenan and agar and the entrapped cells produced max. ethanol. Optimum gel concn. and cell load were determined for immobilization and ethanol production by the organism. Batch fermentation was carried out to optimize fermentation parameters like temp., pH and sugar concn. by free and immobilized cells. AA

1481

Thordsen (O), Lee (SJ), Degelau (A), Scheper (T), Loos (H), Rehr (B), Sahm (H). **A model system for a fluorometric biosensor using permeabilized *Zymomonas mobilis* or enzymes with protein confined dinucleotides.** *Biotechnology and Bioengineering* 42(3); 1993; 387-393

BIOTECHNOLOGY

1482

Best (D). **Food technology faces the future.** *Prepared Foods* 162(6); 1993; 32-33, 36, 38, 40, 42

The outlook for food prices in the US is discussed, with respect to biotechnological applications. Aspects covered include: effects of inflation; expenditure and disposable income; impact of technology at the farm level; use of biotechnology in the dairy industry; technologies for producing lactose-reduced milk; biotechnologically derived foods (delayed ripening tomatoes, soybean oils with improved nutritional profiles); economic benefits of new technologies; and regulatory status of bovine somatotropin. It is concluded that by using biotechnology, food processors will gain economically; consumers, too, will be assured of a safer, more nutritious and better tasting food supply that takes up a smaller share of their disposable income. BV

1483

Tin (CSF) and Mawson (AJ). **Ethanol production from whey in a membrane recycle bioreactor.** *Process Biochemistry* 28(4); 1993; 217-221

Ethanol production from H₂SO₄ whey permeate by *Kluyveromyces marxianus* Y-113 was examined in a membrane recycle bioreactor. The system was operated with 100% cell recycle and at a steady-state with 10 g l⁻¹ biomass. At a dilution rate of D = 0.44 h⁻¹, almost complete utilization of 53 g l⁻¹ lactose was achieved with an ethanol productivity of 8.6 g l⁻¹ h⁻¹. Increasing the inlet lactose concn. or dilution rate increased ethanol productivity but at the expense of lactose utilization. Elevated biomass or ethanol concn. markedly decreased the specific growth rate and specific ethanol production rate. AA

1484

Madhukara (K), Nand (K), Raju (NR) and Srilatha (HR). **Ensilage of mango peel for methane generation.** *Process Biochemistry* 28(2); 1993; 119-123

Mango peel (MP) is a waste product of mango processing. Its disposal can cause pollution problems. Ensilage of MP for 6 months, the effects of ensilage on physicochemical characteristics and methane generation by an anaerobic digestion process were studied. Ensilage helped in the breakdown of polymeric constituents and the conversion of major carbohydrate components into volatile fatty acids. Ensilage MP was a useful substrate for anaerobic digestion for methane generation and the biogas yield was as high as 0.68 m³/kg volatile solids (VS) added, with a methane content of 52%. This compared favourably with 0.43 m³/kg VS added, and a methane content of 50%, for dried MP. Results suggest that the ensilage of MP could eliminate preprocessing (milling and pulverization). BV

1485

Lasko (DR) and Wang (DIC). **In situ fermentation monitoring with recombinant firefly luciferase.** *Biotechnology and Bioengineering* 42(1); 1993; 30-36

A novel methods is described for the online detn. of viable cell number. It was tested in

fermentations of *Escherichia coli*. Cells were transfected with the gene for firefly luciferase and fed low levels of luciferin in the medium. The reaction requires ATP, so the nonviable cells cannot produce light. Thus, light production was linear with viable cell density from inoculation through most of exponential growth. Light emitted by these cells was conducted to the light detection equipment by an optical fibre. As few as a 10^6 cells/ml, or an OD600 of 0.0004, were easily detectable and concn. $> 10^{10}$ cells/ml were well within range. Data were collected by computer, so adaptation to online control applications was straightforward. During lag phase, this method was much accurate than optical density measurements. At the end of exponential growth, rapid changes in light production marked C source depletion and onset of cell lysis. A simple model accounted for the luciferin used during fermentation and corrected the light detected to cell density. AA

TISSUE CULTURE

Nil

FOOD ADDITIVES

Colourants

Dyes

1486

Singh (S), Khanna (K) and Singh (SA). **Technological aspects of permitted azo dyes (yellow): an overall perspective.** *Indian Dairyman* 46(7); 1994; 411-415

Yellow coloured azo dyes are used in various milk products such as icecream, yoghurt, lassi, flavoured milk, khoa and channa-based sweets; jams, jellies, canned foods; cakes; pastry; sugar confectionery; fruit squashes, cordials and nectars. Since they are soluble in water, very slightly soluble in ethanol, insoluble in vegetable oil, good fastness property at 25°C and stable in fruit acids, benzoic acids and SO₂ gas, they have extensive food applications. Sunset yellow FCF and

tartrazine are the important permitted yellow azo dyes. GS

Flavourings

1487

Best (D). **Three dimensions of flavor design.** *Prepared Foods* 162(4); 1993; 30-32, 34

Design of optimum flavour systems for foods is described. Aspects covered include: failures in flavour systems development; flavour perception in foods; flavour complexity; determination of what flavours are supposed to achieve; fundamentals of taste; the 5 senses and how they affect the ultimate perception of flavour; the pharmacology of flavour; and flavour challenges (fat reduction in foods, and maintenance of microwaveable flavour quality). BV

Stabilizers

Gums

Xanthan

1488

Chinnaswamy (R) and Hanna (MA). **Xanthan: Structures, properties and uses.** *Indian Food Industry* 12(3); 1993; 27-37

Production and structure of xanthan gum, its properties (viscosity and rheological properties, compatibility with electrolytes, pH stability, effect of enzymes, effect of salts, properties to structure relationships) and the uses of xanthan gum in food industries, personal care products, industries and oil-fields are outlined in this article. CSA

CEREALS

Acha

1489

Lumen (Bode). Thompson (S) and Odegard (W.J). **Sulfur amino acid-rich proteins in acha (*Digitaria exilis*), a promising underutilized**

African cereal. *Journal of Agricultural and Food Chemistry* 41(7); 1993; 1045-1047

Acha (*D. exilis*) has been reported to be rich in methionine and makes an excellent complement for legumes. 2 sulphur amino acid-rich proteins in acha were identified: M1, mol. wt. 19 000, 21.6% extractable protein, 6.0% Met, 6.4% Cys; and M2, mol. wt. 17 500, 12.9% extractable protein, 7.8% Met, 5.3% Cys. The N-terminal sequences of the 2 proteins had 64% similarities with each other. M2 was 72% homologous with corn zein 10 000 methionine-rich protein and its precursor, while M1 had 53% homology with a bovine transcription factor and 46% homology with *Brassica napus* Napin1 precursor and 2 eukaryotic transcription factors. BV

Breakfast cereals

1490

Garcia (V-B), Guerra (H-E), Martinez (G-E) and Montilla (J). **Liquid chromatography for the determination of 5-(hydroxymethyl)-2-furaldehyde in breakfast cereals.** *Journal of Agricultural and Food Chemistry* 41(8); 1993; 1254-1255

An HPLC method for determining 5-(hydroxymethyl)-2-furaldehyde (HMF) in breakfast cereals (corn, wheat, rice, oats) is presented. HMF is extracted from ground sample (0.4 g) using deionized water (7 ml). Following centrifugation of the mixture, the supernatant is clarified with potassium ferrocyanide (15% w/p) and zinc acetate (30% w/p). After further centrifugation the supernatant is made up to a vol. of 25 ml. Prior to analysis the sample is filtered through a 0.45 µm disc filter. HMF is quantified using a reverse phase C18 column, with a mobile phase of water:acetonitrile (95:5 v/v) at a flow rate of 1 ml/min and UV detection at 285 nm. Average recovery of HMF was 97.7% and the limit of detection was 0.03 µg/g. Levels of HMF concn. ranged from 3.7 to 193.3 µg/g in 23 breakfast cereals comprising 6 brands. BV

1491

Davis (S). **A natural way to start the day.** *Prepared Foods* 162(5); 1993; 63, 66

New breakfast cereal product introduced in the US in 1992 are described. New product introduced in this category increased by 15%. Aspects described include: cereal products developed for marketing in health food stores; ready-to-eat flakes in amaranth, spelt and kamut varieties; hot cereals; and cereals with fruits and nuts. BV

Rice

1492

Prasertsan (S), Satake (T) and Yoshizaki (S). **Breaking behaviour of long grain brown rice.** *ASEAN Food Journal* 9(1); 1994; 36-41

This paper reports the breaking behaviour of long grain brown rice kernel when subjected to longitudinal tensile and compressive loadings, lateral compression and cyclic loadings. The test revealed that the broken surface comprised of many radially-oriented-small ruptured areas and the breaking mechanism was shear failure. The cohesive force of rice kernel was not isotropic. Kernel was relatively weak under transverse tensile strain. Cyclic loading test established a critical cyclic load. Force and breaking cycles exhibited an exponential relationship. SRA

Wheat

1493

McDonald (CE). **Collaborative study on particle size in wheat flour by laser instrument (AACC method 50-11).** *Cereal Foods World* 39(1); 1994; 29-33

A collaborative study was conducted on a laser instrument method to determine particle size in wheat flour. Prior to the study, instruments of the collaborators were checked with a size diagnostic kit for accuracy in determining size parameters. The laser particle size instruments gave satisfactory values for particle size parameters in a collaborative study with 7 lab. analyzing 4 flour samples - a flour sample from hard red spring wheat, a flour sample from soft red winter wheat, and the fine air-classified fractions from these flour samples. For the size parameters, vol. mean diam. and diams. for smaller-than-50, 90 and 10%, the standard deviations for repeatability

in the same lab. (0.5 - 1.6 μm) and reproducibility between lab. (1.6 - 3.0 μm) were low. Repeatability and reproducibility standard deviation for particle size distribution measured as cumulative percent vol. in each of 11 instrument size channels were low for most channels. AA

1494

Wu (YV). **Protein isolate from an experimental high-protein wheat and flour.** *Journal of Agricultural and Food Chemistry* 41(7); 1993; 1048-1052

An experimental high-protein (25% protein, N x 5.7 dry basis) spring wheat (ND 643) and flour from the wheat were used to prepare a protein isolate by alkaline extraction. Optimal extraction of protein was at pH 10.7 in 0.03N sodium hydroxide with a solvent:solid ratio of 6:1. The alkaline extract, after centrifugation, was adjusted to pH 6.2 to yield a precipitate and a supernatant. Bran was separated from starch by screening the second alkaline dispersion. The protein contents of isolates from ground wheat and flour were 90 and 95%, respectively, and accounted for 65 and 68% of the total N in the wheat and flour. Yields of protein isolate were 18 and 16%, respectively, for high-protein wheat and flour compared with 10% for wheat and flour from a typical hard red winter wheat. Protein isolate had a N solubility of 96% at pH 2.6 and a min. solubility of 5.7% at pH 5.8, a hydration capacity of 2.5, an emulsifying activity of 51% and an emulsion stability of 50%. AA

1495

Chin (PM) and Ingledew (WM). **Effect of recycled laboratory backset on fermentation of wheat mashes.** *Journal of Agricultural and Food Chemistry* 41(7); 1993; 1158-1163

Distillers' solubles, soluble components and the liquid obtained after distillation of fermented mash and removal of distillers' grains, are often recycled as 'backset' to reduce effluent treatment costs and water usage. Recycling of laboratory distillers' solubles was carried out over 5 successive fermentations. When 50% backset was used in a 30-gal mash (30 US gal/56-lb bushel, a term used by corn distillers) using wheat as the substrate, yeast

growth and ethanol production remained unaffected over 5 successive fermentations. The final cell yields approximated 9×10^7 yeasts/ml. The alcohol yields ranged from 5.7 to 6.0% w/v. No undesirable substances accumulated in high enough concn. to inhibit normal yeast metabolism. Ca, lactic acid and acetic acid were utilized by the yeasts and removed from the mash. Wheat mashes contained low levels of utilizable free amino N. Yeast extract added to the mash stimulated the rate (but not the amount) of alcohol produced. Optimal supplementation allowed a 40% reduction in fermentation time compared to that of unsupplemented controls. Although yeast extract contains unassimilable substances, no compounds in the backset impeded yeast fermentation through 4 cycles of backsetting at 50%. AA

MILLETS

1496

Agu (RC), Okeke (BC), Nwifo (SC), Ude (CM) and Onwumelu (AH). **Influence of gibberellic acid (GA3) on diastase and cellulase development of Nigerian millet (*Pennisetum maiwa*) and sorghum (*Sorghum bicolor*).** *Process Biochemistry* 28(2); 1993; 105-108

GA3 (0-0.30 mg/l) was sprinkled at steep-out on millet and sorghum during germination and growth at 28°C. Optimum enzyme levels were obtained when 0.20 mg/l of the additive was applied on both cereals. For millet, the highest diastase and cellulase activities were observed on the 5th day of germination (0.20 mg/l GA3 applied at steep-out), while sorghum showed highest activities of these enzymes on 4th day of germination for the same concn. of GA3. AA

Pearl millet

1497

Ansari (AA) and Shrivastava (AK). **Susceptibility of pearl millet (*Pennisetum glaucum*) varieties to toxigenic *Aspergillus ochraceus* for ochratoxin production.** *Indian Journal of Agricultural Sciences* 64(6); 1994; 421-422

Six pearl millet var. (HHB 50, MH 179, HC4, CZMP 2, ICMS 7703 and WCC 75) were inoculated with *A. ochraceus* NRRL 3174 and incubated for 14 days at 28 plus or minus 1°C. Ochratoxin A produced was 1500 p.p.b. in CZMP 2, 1275 p.p.b. in HHB 50, 1018.5 p.p.b. in ICMS 7703, 1275 p.p.b. in HC4, 850 p.p.b. in MH 179 and 797.3 p.p.b. in WCC 75. KAR

Sorghum

1498

Rajavanshi (AK), De (TK), Jorapur (RM) and Nandini Nimbkar. **Jaggery and syrup from sweet sorghum.** *Beverage and Food World* 21(4); 1994; 17-21

This paper describes the agronomy and juice characteristics made from a hybrid sweet sorghum (*Sorghum bicolor* (L.) Moench) (Madhura) syrup and jaggery. Protocols for making excellent product are outlined. Economic analysis and future R and D for this product is also detailed. Aspects covered are short season for jaggery-making, non-availability of sugarcane for jaggery making, poor efficiency of jaggery furnaces, the sols., components of Nimbkar Agricultural Research Institute program, breeding and agronomy of sweet sorghum, juice parameters, process parameters, shelf-life of jaggery syrup, biomass residue gasifier for jaggery furnace, and status of technology. SRA

PULSES

1499

Liu (LH), Hung (TV), Black (R) and Trehwella (MA). **Solubility of grain legume proteins measured by infrared spectroscopy.** *ASEAN Food Journal* 9(1); 1994; 24-29

This report evaluates the application of an infrared spectroscopic technique (milkoScan) for a study of the solubility of chickpea, field pea and soybean proteins over a wide range of pH (2-20) by comparing results from both the Kjeldahl procedure and the instrumental infrared spectroscopy method. Although the values obtained by the Z methods differed at certain pHs (< pH 3 and > pH 9), the milkoScan

still offers a rapid approach for the investigation of grain protein solubility. SRA

1500

Patki (PE) and Arya (SS). **Studies on development and storage stability of instant dhals.** *Indian Food Packer* 48(3); 1994; 31-39

Bengalgram (*Cicer arietinum*), blackgram (*Phaseolus mungo*) and redgram (*Cajanus cajan*) dhal flakes were prepared by soaking in NaCl and carbonate sol., cooking in NaCl and carbonate sol., cooking under 51 psi steam pressure, conditioning to 32-35% moisture, flaking and drying to 5% moisture, flaking and drying to 5% moisture at 100°C. Flaked dhals equilibrated to 2.1-2.3, 5.2-5.8, 8.8-9.8, 14.1-15.3% moisture at 0.0, 0.33, 0.57 and 0.73 aw. Flaked dhals reconstituted within 3 min when mixed with hot water. Flaked dhals were highly susceptible to autoxidation of lipids and developed off-flavours within 3 months at 37°C when stored in polypropylene (PP) and paper-Al foil-poly-ethylene (PFP) laminated pouches. On spicing, flaked dhals remained stable for 1 yr in PFP laminate and for 9 months in PP pouches at 37°C. Spiced and flaked dhals were acceptable to 84-98% of the consumers. AA

Faba beans

1501

Helsper (JPGF), Hoogendijk (JM), Norel (Avan) and Burger (M-K). **Antinutritional factors in faba beans (*Vicia faba* L.) as affected by breeding toward the absence of condensed tannins.** *Journal of Agricultural and Food Chemistry* 41(7); 1993; 1058-1061

The effect of genetic removal of condensed tannins (CTs) on levels of other antinutritional factors in faba beans (*V. faba* L.) was studied by comparison between partners of 6 near-isogenic pairs for trypsin inhibitor activities (TIA), concn. of lectins and pyrimidine glucosides (vicine and convicine), seed wt. and proportion of testa. Each near-isogenic pair consisted of 2 lines which were genetically almost identical, apart from the absence (tannin-free, TF) or presence (tannin-containing, TC) of CTs. Within these pairs no effect of tannin content was observed

on cotyledon-bound TIA or lectin concn. Seeds of TF lines showed higher levels of pyrimidine glucosides, lower seed wt. and lower proportion of testa as compared to TC lines of the same near-isogenic pair. Methanolic extracts from testa of exclusively TC lines showed significant TIA with both porcine and bovine trypsin. This TIA was completely inhibited by 1% poly(vinylpyrrolidone). Data indicate that CTs are responsible for testa-bound TIA. Observations are discussed in relation to the consequences of breeding faba beans, free of CTs, for agricultural characteristics and nutritional quality. BV

Kidney beans

1502

Carbonaro (M), Vecchini (P) and Carnovale (E). **Protein solubility of raw and cooked beans (*Phaseolus vulgaris*): role of the basic residues.** *Journal of Agricultural and Food Chemistry* 41(8); 1993; 1169-1175

Solubility of proteins from 2 var. (Cannellini and Borlotti) of raw and cooked kidney beans (*Phaseolus vulgaris*) was examined. Proteins were extracted in the pH range 1-13, using 0.5M HCl or NaOH to adjust the pH, with water, 0.1 or 0.5M NaCl. Proteins were least soluble at pH 4. Extracting with 0.5M NaCl rather than water increased solubility of proteins in the pH range 2-7. Cooking beans reduced the solubility of proteins, in water and NaCl, below pH 10. Increasing the protein extraction time for cooked beans from 1 to 24 h showed that the higher the pH, the higher the rate of protein solubilization. Max. solubility of proteins from cooked beans was observed in 0.8M urea at pH 7.5. Chemical modifications of the basic protein residues on protein solubility was also studied. Lysine residues were acetylated or succinylated and arginine residues were treated with phenylglyoxal. All treatments increased protein solubility in water. Succinylation increased protein solubilization from cooked beans. Proteins water extracted at pH 6.5 from cooked and raw beans were characterized using SDS-PAGE and ultracentrifugation. Proteins from cooked beans showed greater dissociation than those from raw beans; dissociation was increased at an extraction pH of 12. An involvement of basic residues in the

association-dissociation of raw and cooked bean proteins is suggested. BV

Peas

1503

Pawar (VN), Gunjal (BB), Ingle (UM) and Ghatge (UM). **Studies on the varietal differences in some physico-chemical characteristics and quality of frozen peas (*Pisum sativum* L.).** *Indian Food Packer* 48(4); 1994; 5-16

Cylindrical pea pods of 4 cv., viz. Early Badger, Bonneville, Khaparkheda and P-388-1, which were light green in colour and without wrinkles were selected. Pod wt., grain wt., and husk wt. per pod were found to be highest for Early badger and lower for Khaparkheda. Blanching time for pea cv. ranged between 1 1/2 and 2 1/2 min in hot water and ammonium bicarbonate sol. (0.2%, w/v) at 97.5°C temp. Blanched peas were frozen in air blast freezer (-30°C) and stored in deep freezer (-20°C) for 4 1/2 months. The % loss of ascorbic acid and retention of total chlorophyll were more in peas blanched with ammonium bicarbonate sol. than in hot water. Max. retention of ascorbic acid was observed in case of Bonneville followed by Early Badger, Khaparkheda and P-388-1. Blanching in ammonium bicarbonate sol. reduced the loss of total chlorophyll better than hot water blanching. Decline in % moisture, ash, ascorbic acid and total chlorophyll was relatively less during freezing than blanching. Sensory quality of Early Badger, Bonneville and P-388-1, being comparable, was significantly superior to Khaparkheda. AA

OILSEEDS AND NUTS

Cashew nuts

1504

Muroi (H), Kubo (A) and Kubo (I). **Antimicrobial activity of cashew apple flavor compounds.** *Journal of Agricultural and Food Chemistry* 41(7); 1993; 1106-1109

Antimicrobial activity of the 10 most abundant flavour compounds of cashew apple (*Anacardium occidentale*), were tested. Most of

them exhibited some activity against one of 14 microorganisms (yeasts, bacteria and fungi). (E)-2-Hexenal showed activity against all the microorganisms tested, including Gram-negative bacteria. Antibacterial activity of indole against *Escherichia coli* was enhanced 4-fold by combining it with a sublethal amount of (E)-2-hexenal. The min inhibitory concn. of this combination was found to be bactericidal by the time-kill curve method. BV

Groundnuts

1505

Tamilselvan (C) and Sundararajan (R). **Terminal residues of metolachlor in groundnut (*Arachis hypogaea*), soybean (*Glycine max*) and onion (*Allium cepa*).** *Indian Journal of Agricultural Sciences* 64(7); 1994; 495-497

Metolachlor, a pre-emergence herbicide was sprayed at 1.0, 1.5 and 2.0 kg ai/ha 3 days after sowing groundnut, soybean and onion. Residue of metolachlor was not detected in groundnut kernel and soybean seed at harvest but onion bulb contained 0.01 and 0.06 mg/kg at the application dosage of 1.0 and 2.0 kg ai/ha respectively. KAR

Safflowers

1506

Joseph (A) and Dikshit (M). **Effect of irradiation on the proteinase inhibitor activity and digestibility (in vitro) of safflower oilcake.** *Journal of the American Oil Chemists' Society* 70(9); 1993; 935-937

Trypsin and chymotrypsin inhibitor activities of safflower oilcake (SOC) were studied before and after irradiation. Samples of SOC were exposed to doses ranging from 7 Gy to 10 kGy. The trypsin inhibitor is inactivated at 42 Gy, whereas the chymotrypsin inhibitor remains active, even at the much higher dose of 10 kGy. The *in vitro* digestibility values also showed a significant improvement after irradiation. Exposure to a low dose of 42 Gy is sufficient to improve the nutritional value of SOC. BV

Soybeans

Soy products

1507

Arvind Kumar, Mittal (SK) and Singh (G). **Chemical characteristics of some by-products of soy industry.** *Beverage and Food World* 21(4); 1994; 30-31

Soy residue (SR) without hulls - a by-product of soy processing industry contained the highest amounts of protein (38.73%), fat (19.13%) and reducing sugars (2.37%) and lowest amount of crude fibre (CF), carbohydrates, total acid (TA) and acid insoluble ash (AIA), Ca, P, acid detergent fibre (ADF) and neutral detergent fibre (NDF). Hulls on the other hand exhibited max. contents of CF, carbohydrates, TA, AIA, Ca, P, ADF and NDF. SR without hulls exhibited more non-enzymatic browning than the other preparations. BV

TUBERS AND VEGETABLES

Onions

1508

Sharma (PK) and Nirankar Nath. **Effect of ambient storage and sprouting on physico-chemical and dehydration characteristics of onion cultivars.** *Beverage and Food World* 21(4); 1994; 15-16

Storage characteristics of 10 onion var. sprouted during 6 months at 30 plus or minus 3°C, 40 - 80% RH, and dehydration characteristics of sprouted onion were investigated. Total wt. loss of onion ranged from 25% (white var.) to 80% (Red var.), av. loss of bulb wt. was 8.4-44.3% and increase in pyruvic acid content was 30.8-293.1%. Sprouting reduced during storage, but shrinkage and dehydration ratio increased by 9.6-30.6 and 1.2-23.7% respectively. Lower storage losses in Pusa white round, Pusa white flat and Pusa red var. indicated that their storage characteristics under ambient conditions were superior to those of the other 7 var. SRA

1509

Goswami (SN). **Production and price behaviour of potato (*Solanum tuberosum*) in Khasi hills region of Meghalaya.** *Indian Journal of Agricultural Sciences* 64(7); 1994; 468-473

Cyclic variation in the production and price of potato was determined by collecting data for 24 yr. (1964-65 to 1987-88) with Khasi hills of Meghalaya State, India. Fourier and correlogram analysis showed that in production and prices regular cycles of a given length appeared and they did not persist in uniform manner. Amplitude of the swing in the price cycle was larger than that in the production cycle. Variation in production and price of potato was lower in recent yr. (1986-87 and 1987-88) than in early yr. (1964-65 and 1966-67). KAR

1510

Sanchez (F-A), Laveda (F) and Garcia (C-F). **Cresolase activity of potato tuber partially purified in a two-phase partition system.** *Journal of Agricultural and Food Chemistry* 41(8); 1993; 1225-1228

Cresolase monophenol monooxygenase, (EC 1.14.18.1) activity from potato, extracted by 2 phase partition, was characterized. Activity was characterized by a lag period, the duration of which depended on the substrate concn., pH and presence of catalytic amounts of o-diphenols. By increasing the concn. of o-diphenols to 50mM, activation energy of the enzyme, Kcat, was increased to 4.5 μ M. A mechanism is proposed which explains the loss of monophenol monooxygenase activity usually occurring during purification. AA

1511

Sanchez (Ferrer-A), Laveda (F) and Garcia (C-F). **Partial purification of soluble potato polyphenol oxidase by partitioning in an aqueous two-phase system.** *Journal of Agricultural and Food Chemistry* 41(8); 1993; 1219-1224

1512

Klingspohn (U), Bader (J), Kruse (B), Vijai Kishore, (P), Schuegerl (K), Kracke (Helm-HA), Likidis (Z). **Utilization of potato pulp from potato starch processing.** *Process Biochemistry* 28(2); 1993; 91-98

Potato pulp consisting of pectins, starch, cellulose and hemicellulose was separated by treatment with dilute sulphuric acid into pectins, starch, cellulose and hemicellulose. Pectins and starch were separated by fractional precipitation with methanol or acetone. The pulp residue (PR) consisting of hemicellulose and cellulose was enzymically converted to glucose and xylose and fermented by *Pachysolen tannophilus* to produce ethanol. The PR and the residue of the enzymic decomposition (RES) were used as substrates for enzyme production by *Trichoderma reesei* Rut C30 and MGC 77 in batch and continuous cultures. The highest specific enzyme activities (6.1 U mg⁻¹ avicelase, 23.4 U mg⁻¹ carboxymethylcellulase, CMCase and 66.8 U mg⁻¹ xylanase) and productivities (8.9 U l⁻¹ h⁻¹ avicelase, 34.3 U l⁻¹ h⁻¹ CMCase and 97.8 U l⁻¹ h⁻¹ xylanase) were obtained with RES in batch culture. The enzyme mixture in the cultivation medium was concentrated by ultrafiltration membrane treatment and diafiltration. Product quality was comparable with commercially available cellulases. The economy of the process was mainly influenced by utilization of pectins, starch and enzymes. Ethanol production from the hydrolysate of cellulose/hemicellulose was not economic because of the low sugar concn. in the hydrolysate. AA

1513

Sandhu (KS) and Bawa (AS). **Requirements for quality potato chips - an overview.** *Indian Food Industry* 12(4); 1993; 47-50

Describes the required quality factors for potato chips which fall into 3 major groups namely (1) raw materials which include potato size and shape, peel, appearance, sp. gr., frying time, colour, sugar content, flavour, blisters, oil/fat, salt and other additives; (2) unit operations and (3) packaging technology. CSA

Sweet potatoes

1514

Chen (BH) and Chen (YY). **Stability of chlorophylls and carotenoids in sweet potato leaves during microwave cooking.** *Journal of Agricultural and Food Chemistry* 41(8); 1993; 1315-1320

The effects of microwave cooking on stability of chlorophylls and carotenoids in sweet potato leaves [eaten as a green vegetable in Taiwan] were studied. Each cooking treatment was conducted at 2450 MHz with an output power of 700 W for 0, 2, 4 or 8 min (in duplicate). Chlorophylls and carotenoids were analysed by HPLC with photodiode array detection. In most cases the content of each pigment decreased with increasing heating time. Chlorophylls and epoxy-containing carotenoids were most susceptible to heat loss. Pigments formed during microwave cooking included chl *b* isomer, chl *a* isomer I, chl *a* isomer II, pheophytin *b*, pheophytin *a*, pyropheophytin *a*, cis-neochrome and 2 lutein dehydration products, 3,4-didehydro- β , ϵ -caroten-3'-ol and 3',4'-didehydro- β , β -caroten-3-ol. AA

Vegetables

1515

Sashi Prabhu, Banerjee (AK), Saraswat (RK) and Surjeet Singh. **Studies on preparation of commercially feasible mixed vegetables soup with nutritive value.** *Indian Food Packer* 48(3); 1994; 19-24

In the comparative study of various ready-to-serve soup combinations on the maintenance of colours, desirable sensory quality and nutritive value, recipe with tomato pulp (74.4%), pea grains (4.8%), beans shredded (4.8%), carrot paste (9.5%), sugar (2.5%), salt (1.5%), ginger extract (1%), black pepper powder (0.3%) and cumin powder (0.3%) was rated as best having secured 71.75 to 88.75% marks while recipe with tomato pulp (48.8%), carrot paste (48.8%), sugar (1.2%) and salt (1.2%) as the most inferior having secured only 48.0 - 63.75% marks, after 6 months of storage. GS

1516

Wintoch (H), Morales (A), Duque (C) and Schreier (P). **(R)-(-)-(E)-2,6-dimethyl-3,7-octadiene-2,6-diol 6-O- β -D-glucopyranoside: natural precursor of hotrienol from lulo fruit (*Solanum vestissimum* D.) peelings.** *Journal of Agricultural and Food Chemistry* 41(8); 1993; 1311-1314

A glycosidic fraction was obtained from a methanolic extract of lulo (*S. vestissimum* D.) peelings by Amberlite XAD-2 adsorption and methanol elution. Using pre separation by rotation locular countercurrent chromatography, subsequent acetylation and liquid chromatographic purification, a glycoside was isolated in pure form whose structure was elucidated by desorption chemical ionization-MS and NMR analyses to be the 6-O-linked beta-D-glucopyranoside of (R)-(-)-(E)-2,6-dimethyl-3,7-octadiene-2,6-diol. AA

Leafy vegetables

1517

Dewanji (A). **Amino acid composition of leaf proteins extracted from some aquatic weeds.** *Journal of Agricultural and Food Chemistry* 41(8); 1993; 1232-1236

Chemical composition and amino acid profile of leaf protein extracted from 5 aquatic weeds (*Alternanthera philoxeroides*, *Azolla pinnata*, *Lemna minor*, *Limnanthemum cristatum* and *Pistia stratiotes*), were investigated. The N content in the leaf proteins ranged from 6.1 to 8.7%, β -carotene levels varied from 462.5 to 674.7 μ g/g and total polyphenols ranged from 1.3 to 2.9%. There were no large differences in the amino acid composition of the 5 samples, suggesting that protein of a uniform composition could be extracted from aquatic plants. Levels of essential amino acids in the leaf proteins compared favourably with FAO reference patterns and chick requirements, indicating that leaf protein extracted from unwanted aquatic plants could be used for food/feed purposes. Even the fibrous by-product, left after the extraction of aquatic leaf proteins, having 2.1-3.2% N and low nitrate

contents (0.23-0.65%) could be utilized as an additional feed for ruminants. AA

FRUITS

1518

Sahni (CK), Khurdiya (DS) and Dalal (MA). **Studies on physico-chemical characteristics of certain fruits.** *Indian Food Packer* 48(3); 1994; 5-9

Juice % worked out in 5 fruits viz. mango (Dashehari), apple (Royal delicious), pineapple, plum (Santarosa), and orange (Santra) varied from fruit to fruit, depending on preparatory losses and extraction methods. Max. juice yield was in plum followed by apple, orange and pineapple. Juice content in apple was 58.10%. Yield of orange juice, pineapple juice and mango pulp was around 40%. Mango juice had the max. TSS (20°B) followed by plum, apple, orange and pineapple (9°B). Highest acidity (1.89%) was in plum followed by pineapple, orange, apple and mango (0.25%). Brix-acid ratio was highest (80) in mango and least (8.4) in plum. Mango and orange fruits had appreciable amount of total carotenoids, which other fruits lacked. GS

1519

Mahadeviah (M), Sheshadri (KS), Gowramma (RV) and Crown (JK). **The colour deterioration of some processed fruit products packed in different packaging materials during storage.** *Indian Food Packer* 48(4); 1994; 23-28

Colour variation in mango juice, mango pulp, banana pulp and pineapple slices packed in flexible laminate pouches, glass jars and cans were studied and methods to improve the colour retention were evaluated. The colours of the fruit products was more brownish in flexible pouches and moderately brownish in glass jars as compared to tin plate cans. Hydroxymethyl furfural was slightly less in pouches and glass jars as compared to cans. Loss of carotenoid pigments was more in flexible pouches than in other containers. GS

1520

Qing (W-N) and Eads (TM). **Liquid-phase composition of intact fruit tissue measured by high-resolution proton NMR.** *Journal of Agricultural and Food Chemistry* 41(7); 1993; 1026-1034

High-resolution ^1H NMR spectra were obtained for intact fruit (grape, banana and apple) tissues. Liquid-phase component line widths showed field-dependent broadening due to magnetic susceptibility effects; the effect was larger in more physically heterogeneous tissues (apple > banana > grape). Magic angle spinning reduced susceptibility broadening, while water peak suppression increased dynamic range, enabling detection of components at levels of < 0.01% of fresh wt. Water, glucose, fructose, sucrose, organic acids (malic, citric, tartaric) and total fatty acyl lipids were quantified. Longitudinal relaxation times of nonexchangeable glucose protons were measured *in situ* in banana and were dominated by intra- and intermolecular homonuclear dipolar interactions. This is similar to the situation *in vitro*. Rotational motions of water sugar molecules within fruit appeared to be relatively unhindered. The combined results have implications for nondestructive analysis of heterogeneous materials and for design of new devices for quality assessment, laboratory analysis and process monitoring. AA

1521

Gergova (K), Petrov (N), Butuzova (L), Minkova (V) and Isaeva (L). **Evolution of the active surface of carbons produced from various raw materials by steam pyrolysis/activation.** *Journal of Chemical Technology and Biotechnology* 58(4); 1993; 321-330

A 1 step pyrolysis/steam activation was used to produce activated carbons from apricot stones, nuts, coconuts, almond shells and grape seeds, and Bulgarian lignite. Evolution of the active surface of the carbons was investigated. Results indicate that the adsorption properties of activated carbons were dependent on treatment temp., soak time and the raw materials. BV

1522

Davis (S). **Ripe for the picking.** *Prepared Foods* 162(5); 1993; 87-88

New products introduced in the fruit and vegetable products category in the US in 1992 are described. 276 items were launched. 15% of the items were fresh fruit and vegetable products. Aspects considered include: nutritional aspects of fruits and vegetables; combination packs of ready-to-eat vegetables and salads; microwaveable mixes of vegetables; dried fruit snacks; mini bananas; canned vegetables for use on pizza; and new-style beans. BV

Apples

1523

Mahajan (BVC) and Chopra (SK). **Studies on the storage behaviour of apple packed with ethylene absorbents.** *Indian Food Packer* 48(3); 1994; 11-18

The effect of different absorbents on the ethylene evolution, respiration rate of apple fruits and their storage behaviour in the cold storage were studied. Ethylene evolution and respiration rate was low initially, increased steadily to reach a peak value between 60 and 90 days of storage and then declined gradually towards the end of storage. Fruits packed with the sachets of Purafil (an ethylene absorbent) delayed the ethylene evolution and respiration rates upto 90 days of storage. GS

1524

Drake (SR). **Short-term controlled atmosphere storage improved quality of several apple cultivars.** *Journal of the American Society for Horticultural Science* 118(4); 1993; 486-489

Controlled atm. (CA) storage for 30 or 60 days reduced quality losses for 'Jonagold' (J), 'Golden delicious' (GD), 'Delicious' (D), 'Granny Smith' (GS), and 'Fuji' (F) apples. After 30 days J and GD from CA storage were firmer, had higher acidity and were less yellow than apples from regular atm. (RA) storage. D and GS were firmer after 60 days of CA storage than fruit from RA. In addition GS from CA had more acid

(0.80%) and were greener than apples from RA. After ambient storage for 8 days, J, GD and GS apples retained a freshly harvested apple colour of more green and less yellow development when stored in CA rather than RA. In F apples, the treatments had no effect except for improved acid retention if stored in CA. A combination of 30 days CA followed by 30 days RA produced J, GD and D that were superior to apples from 60 days RA. SRA

1525

Burmeister (DM) and Dilley (DR). **Characterization of Mg^{2+} -induced bitter pit-like symptoms on apples: a model system to study bitter pit initiation and development.** *Journal of Agricultural and Food Chemistry* 41(8); 1993; 1203-1207

Vacuum infiltration of $MgCl_2$ solutions into intact apples induces bitter pit-like symptoms [Mg^{2+} -induced pits (MgIP)]. Including Ca^{2+} in the infiltration media prevents MgIP. Golden Delicious apples were infiltrated with various concn. of Ca^{2+} and Mg^{2+} with and without Ca^{2+} -affecting reagents or other cations. Including trifluoperazine with Mg^{2+} produced more pitting than Mg^{2+} alone. Verapamil and nefedipine had no effect on MgIP or its attenuation by Ca^{2+} . Cyclopiazonic acid attenuated MgIP. Ethylene glycol bis(β -aminoethyl ether)-N,N,N',N'-tetraacetic acid and 2,3,5-triiodobenzoic acid attenuated MgIP. Cycloheximide and actinomycin D inhibited MgIP, while puromycin had no effect. Heating fruits at 38°C prior to infiltrating fruits with $MgCl_2$ attenuated MgIP. Ba^{2+} , La^{3+} , Co^{2+} and Sr^{2+} at 20.0mM prevented MgIP (induced by 0.18M Mg^{2+}). Ca^{2+} (3.0mM) included with 0.18M Mg^{2+} inhibited MgIP 50%. K^+ and Na^+ partially inhibited MgIP. Treatments affecting calcium homeostasis or cellular metabolism can alter MgIP development. It is concluded that MgIP may be a useful tool to understanding natural bitter pit development. AA

Banana

1526

Ramana (SV) and Jayaraman (KS). **A method to evaluate degree of ripeness of banana.** *Indian Food Packer* 48(4); 1994; 17-22

The simple analytical method for determining the degree of ripeness of banana involves analysis of comminuted pulp samples for total solids by drying and total soluble solids by refractometer. The difference between these values in naturally ripened fruits before a loss of 5% wt. was in the range of 15.22 to 1.01% at ambient conditions (25-28°C; 60-65% RH). The method can assist in judging the ripeness of banana intended for trade. Banana exposed to ethylene gas for 24 h showed no rapid ripening changes and those exposed for longer periods were spoiled due to rapid condensation of moisture. AA

1527

Qing (X-N) and Eads (TM). **Analysis by proton NMR of changes in liquid-phase and solid-phase components during ripening of banana.** *Journal of Agricultural and Food Chemistry* 41(7); 1993; 1035-1040

Changes during ripening in solid-phase and liquid-phase components of intact banana tissue (pulp) were monitored by NMR. Solid-selective cross-relaxation NMR showed that rigid components, dominated by starch, decreased from 20% of fresh wt. at the mature green stage to 2.0% at the ripe yellow stage. Transverse relaxation measurements and wide-line NMR verified that starch in banana is as rigid as in isolated hydrated granules from banana. A less rigid component was also detected. Liquid-phase components were measured by low-speed magic angle spinning NMR. Resonances of water, sucrose, fructose, glucose, fatty acyl chains of mobile lipids and organic acids were easily detected. During ripening, sucrose concn. increased from 2.2 to 8.5% fresh wt., fructose from 0.5 to 5.3% and glucose from 0.4 to 4.3%. Starch conversion to sugars was also quantified. NMR analysis was conducted without tissue disruption, separations, chemical treatment or other spectrometry. The potential applications of NMR for fruit and fruit product quality assessment and processing applications are discussed. AA

Carambola

1528

Ghazali (HM), Ming (TC) and Hashim (DM). **Effect of microwave heating on the storage and properties of starfruit honey.** *ASEAN Food Journal* 9(1); 1994; 30-35

Microwave energy was used to heat-treat the starfruit (*Averrhoa carambola* L.) honey at 71°C. Untreated honey was used as the control. The honeys were then stored at 4°C or room temp. (28 plus or minus 2°C). Physical and chemical properties were monitored over 16 wks. Spoilage due to fermentation occurred in unheated honey stored at ambient temp., and granulated when stored at 4°C. Both heated and unheated honeys darkened during storage at room temp. Heating lowered diastase activity and yeast count. This method is regarded as a short term or temporary measure to protect high moisture content honey from rapid quality deterioration. SRA

Cherries

1529

Chandra (A), Nair (MS) and Iezzoni (AF). **Isolation and stabilization of anthocyanins from tart cherries (*Prunus cerasus* L.).** *Journal of Agricultural and Food Chemistry* 41(7); 1993; 1062-1065

Isolation of anthocyanins from tart cherries (Montmorency or English Morello cv. and 3 hybrids) is presented. Juice is centrifuged and applied to a column of XAD-2 resin washed in ethanol. The column is washed with water until the colourless washings are at pH 7.0. Absorbed material is then eluted with ethanol. The ethanol eluent is concentrated under vacuum and lyophilized. Quantity of pigments isolated depended upon cherry cv. and juice type, i.e. conc. or single strength. Stability of anthocyanin powders obtained by this method and aqueous solutions prepared from them, as well as stability of anthocyanins in juice, was studied. Phosphoric acid, maltodextrin or α - or β -cyclodextrin was added to stabilize anthocyanins. Juices stored for 12 wk with β -cyclodextrin contained 49, 37, 32, 69 and 55% of the original anthocyanin levels, respectively, for Montmorency, English Morello and the 3 hybrids. Juices stored without dextrins had lower levels of anthocyanins. Anthocyanin powders with added dextrins were stable at room temp. for 12 wk. Extracts stored

as powders showed less degradation than those in sol. AA

Grapefruits

1530

McDonald (RE), McCollum (TG) and Nordby (HE). **Temperature conditioning and surface treatments of grape fruit after expression of chilling injury and gas diffusion.** *Journal of the American Society for Horticultural Science* 118(4); 1993; 490-496

'Marsh' Grapefruit (*Citrus paradisi* Macf.) were temp. conditioned (7 days at 15°C), wiped with hexane, treated with squalene, squalane or safflower oil (all 10% in hexane), or waxed with a commercial fruit wax (Flavorseal) to determine their effects on wt. loss, chilling injury (CI) symptoms on the peel, and gas exchange. Following 3 wks of storage at 5°C, wiping fruit with hexane resulted in a significant decrease in wt. loss, but not CI. Temp. conditioning and Flavorseal independently inhibited wt. loss and CI development. Squalene inhibited CI development, but not wt. loss. Chilling injury on fruit treated with squalene or Flavorseal was similar in appearance, but significantly less common than that on nontreated fruit. Grapefruit peel accounted for 92% of the gas diffusion of fruit, and resistance coefficients for peel and whole fruit were similar. Less ethane diffused into fruit that were: temp.-conditioned compared with nonconditioned, hexane wiped compared with nonhexane-wiped, and squalene-treated compared with nonsqualene treated fruit. Ethane influx was significantly restricted into squalene- and squalane-treated fruit compared with Flavorseal- or safflower oil-treated fruit. Oxygen and CO₂ influx was significantly reduced by Flavorseal, safflower oil, squalene, and squalane. Squalane was the most restrictive of ethylene efflux followed by safflower oil, squalene, and Flavorseal. All of these surface treatments are known to reduce CI on grapefruit. These data indicate that water loss is less important to the development of CI than has been previously suggested, and that the beneficial effects of squalene are not the result of an inhibition of water loss. Permeability of grapefruit peel to gases other than H₂O vapor may also influence the expression of CI. AA

Kinnow mandarin

1531

Khurdiya (DS) and Lotha (RE). **Kinnow mandarin storage and processing - a review.** *Indian Food Packer* 48(4); 1994; 33-49

Effect of storage treatments, processing and preservation conditions on the physico-chemical characteristics like shelf-life, juice content, peel content, pomace, TSS, pH, acidity, ascorbic acid, sugars, carotenoids, pectin, density, viscosity, cloud, colour, citrus peel oil of Kinnow mandarin fruit are reviewed. GS

Sapota

1532

Abu Bakar (F) and Abdul-Karim (MNB). **Chemical treatments for microbial control on sapota.** *ASEAN Food Journal* 9(1); 1994; 42-43

Mature sapota ((ciku) *Achras sapota* L., *Manilkara achras* L.) were treated with (1) dry sponging, (2) water, (3) benlate (methyl N-(1-butylcarbomoyl) at 0.2 mg/kg, (4) diflotan (N-(1, 1,2,2-tetrachloroethyl thio) cyclohexe-ene-1,2 dicarboximide) at 2 mg/kg, and (5) captan (1,2,3,6-tetrahydro-N-trichloromethylthiophthalimide) at 15 mg/kg to prevent bacterial population. The chemical treatments suppressed the microbial population. Dry sponging and water gave some protection but less than chemical treatments. Among the chemical treatments, benlate seemed to be the most effective with respect to its potency and cost. SRA

CONFECTIONERY, STARCH AND SUGAR

Confectionery

1533

Davis (S). **New candy geared for the 'sour-tooth'.** *Prepared Foods* 162(5); 1993; 69-70

New product introduced (22%) in the sugar confectionery category in the US in 1992 are discussed. Aspects considered include: sour flavoured candies; tongue-colouring confectionery; character-theme candies; and chocolate products. BV

1534

Anon. **Nuts about almonds.** *Prepared Foods* 162(6); 1993; 62

Use of almonds in a variety of sugar confectionery products is discussed. Aspects discussed include: diced and whole almonds; almonds in sugar-free candy; maintaining almond quality; grading of almonds; and quality assurance. BV

Chocolates

1535

Jana (AH) and Thakar (PN). **Fat bloom in chocolates and confectionery coatings - a review.** *Indian Food Industry* 12(4); 1993; 33-39

The characteristics of fat bloom, a white or greyish haze occurring during the storage of chocolate; resistance measurement of the bloom; causative factors and mechanistic considerations for the occurrence of fat blooms such as migration of cocoa-fat crystals, decomposition into mixed crystals, polymorphic transformation, development of stress, latent crystal heat changes, improper tempering and rapid cooling, use of incompatible fats, type of chocolate products and the preventive measures undertaken to combat fat bloom are by (i) physical means (temp. adaptation of the centres, tempering, cooling of the enrobed pieces); (ii) chemical means (emulsifiers, seed materials, fat and oil, speciality fats, whey powders, selective hydrogenation of fats) are the aspects reviewed in this article. 57 references. CSA

Starch

1536

Sarmidi (MR) and Barker (PE). **Saccharification of modified starch to maltose in a continuous rotating annular**

chromatograph (CRAC). *Journal of Chemical Technology and Biotechnology* 57(3); 1993; 229-235

Simultaneous biochemical reaction and separation was performed in a continuous rotating annular chromatograph (CRAC) for enzymic saccharification of liquefied starch to maltose. The enzyme was a thermostable, exo-acting, recombinant *Bacillus stearothermophilus* maltogenic alpha-amylase. A simple optimization procedure was used to regulate vol. and concn. in the CRAC. With potato starch as substrate, maltose conversions of up to 79% were achieved at feed flow rates of up to 400 cm³ h⁻¹ and 15.5% w/v concn. Resolution between maltose and dextrans was 0.92. AA

Sugar

Sugarcane

1537

Patil (JP), Jadhav (HD), Wandre (SS) and Hasabnis (AB). **Screening of different sugarcane varieties for quality jaggery and storability.** *Indian Sugar* 44(2); 1994; 123-127

Out of 11 sugarcane var. (COC 671, COM 7129, CO 7527, CO 7628, CO 7634, COM 7704, COM 7712, CO 7219, CO 419, CO 775, CO 740) raised in identical conditions, at Regional Sugarcane and Jaggery Research Station, Kolhapur, India, CO 775 and promising lines COC 671, CO 7527, CO 7634 registered satisfactory quality of juice, jaggery and also their storage stability. SRA

1538

Kathiresan (G), Narayanasamy (MR) and Veerabadran (V). **Post-harvest deterioration in weight and juice quality of cane varieties.** *Madras Agricultural Journal* 80(10); 1993; 547-551

Harvested canes of sugarcane var. viz. CoC 85061 and CoC 671 were stalled in open sun light, under tree shade and in open sunlight covered with cane trash. Loss in cane wt. and juice quality was estimated at 24 h interval. The cane stored under tree shade and stored

upto 48 h recorded significantly min. loss of cane wt. and juice quality. The CoC 85061 recorded lesser loss in cane wt., sucrose content, purity and commercial cane sugar and higher gain in reducing sugar content. AA

BAKERY PRODUCTS

1539

Dornblaser (L). **Pyramid power lures bakers.** *Prepared Foods* 162(5); 1993; 48, 51-52

New bakery products developed in the US in 1992 is discussed, with respect to approval of the Food Guide Pyramid, which recommends that consumers eat 6-11 portions of breads, cereals, rice and pasta daily. Total bakery product introduced were 1508. Aspects discussed include: bread products with reduced-fat; reduced-fat cookies; bread made with spelt; ethnic foods (Italian breads); shortbreads; and character-theme products. BV

1540

Davis (S). **New snacks capture healthy market.** *Prepared Foods* 162(5); 1993; 101-102

New snack foods products introduced in the US in 1992 are described. Aspects considered include: line extensions (healthier versions of existing product lines); low sodium, low fat flavoured crisps; pretzels containing honey, sesame seeds and wholewheat flour; sourdough pretzels; crosses between tortillas and crisps; thin tortilla chips; and meat snacks. BV

Cakes

1541

Davis (S). **New ingredients make baking a piece of cake.** *Prepared Foods* 162(5); 1993; 55

Development of new dried mixes (250) for bakery products in the US in 1992 is described. Aspects considered include: bread mixes; bread mixes for bread machines; muffin mixes containing fat substitutes; and cookie mixes to be used as pie crusts. BV

Chapaties

1542

Anita Rawat, Singh (G) and Mital (BK). **Microbiological characteristics of soy fortified chapatias.** *Beverage and Food World* 21(4); 1994; 22-23

Microbiological characteristics of dough and chapatias made by soy fortification of whole wheat flour (WWF) is reported. Dough made from WWF exhibited greater total plate count, proteolytic count and coliform count than the dough made from blend of WWF and defatted soy flour in ratio of 90:10. These counts increased considerably during storage of dough samples at ambient temp. of 22 plus or minus 1°C, whereas their growth was restricted at 4 plus or minus 1°C. There was marginal increase in total bags at ambient temp. for 4 h. Baking of chapatias totally inhibited growth of coliforms. SRA

Pasta

1543

Davis (S). **Pasta-mania keeps side dish category cookin'.** *Prepared Foods* 162(5); 1993; 97-98

New side dish products introduced in the US in 1992 are described. 560 new items were introduced. Aspects considered include: pasta products; refrigerated pasta side dishes; potato fries; flavoured rice products; and ethnic rice dishes. BV

MILK AND DAIRY PRODUCTS

1544

Prajapati (JP), Jana (AH) and Patel (HG). **Application of lecithin in dairy industry - a review.** *Beverage and Food World* 21(4); 1994; 24-29

Aspects covered in this review are composition of lecithin, mode of action of lecithin, functional properties of lecithin, application in dairy products, reconstituted milk and cream.

instant powders (whole milk powder, caseinates), fermented milk and milk products (fermented milks, dahi and yoghurt, cheese), fat-rich products (whipping cream, coffee cream, butter/recombined butter, margarine, low-calorie spreads), sterilized whole milk concentrates, ice cream and chocolate couverture, coffee whiteners and dietetic products. 63 references. SRA

1545

Rao (VM). **Productivity improvement at Kolhapur Milk Union (Maharashtra)**. *Indian Dairyman* 46(7); 1994; 377-383

1546

Singh (AJ), Sain (I) and Joshi (AS). **Prospects for dairying in Punjab**. *Indian Dairyman* 46(7); 1994; 417-420

Trends in contribution of dairying towards farm income in Punjab, India; pattern of disposal of milk for different size categories of farms and zones; pattern of processed products over time; performance of milk cooperative societies over period; and margins of the milk plants over costs for different products are analysed. GS

1547

Friedman (M) and Dornblaser (L). **Creativity spurs dairy category growth**. *Prepared Foods* 162(5); 1993; 77-78

New product introduced in the dairy products category in the US in 1992 are described. A 19% increase in the number of new products was observed. Trends included increases in low fat and healthy products. Aspects covered include: speciality milks (low-cholesterol milk, lactose-reduced milk); blended cheeses; non-fat cheeses; fat free dairy products; yoghurts aimed for children; ice cream mixed with cookie dough; and yoghurt and fruit juice drinks. BV

Milk

1548

Singh (AJ) and Singh (RP). **Economic aspects of milk marketing in Punjab**. *Indian Dairyman* 46(7); 1994; 403-410

Pattern of milk production, consumption and marketed surplus; disposal of marketed surplus of milk on different size categories of farms; marketing costs and margins of different agencies for different channels; economics of milk production; and pricing and distribution of milk are evaluated. GS

1549

Sapra (RK) and Bindal (MP). **Recombined milk prepared with ghee in comparison to butter-oil. I. Reconstitution**. *Indian Journal of Animal Science* 64(7); 1994; 770-773

The problems of fat separation and unacceptable flavour encountered with recombined milk prepared with ghee have been successfully eliminated by modification in recombination process. The quality of ghee as judged by peroxide value (PV) and FFA level and also the quality of SMP (low heat vs high heat) had a direct effect on the quality of recombined milk. AA

Milk products

1550

Dornblaser (L). **Indulgent ways to end a meal**. *Prepared Foods* 162(5); 1993; 81

Ninety three new dessert products were introduced in the US in 1992; of those, less than 25% were low-calorie or low-fat. Dessert toppings comprised two thirds of the category. Aspects considered include: thick chocolate sauce; ice cream toppings; blue-coloured food products; and healthy refrigerated puddings. BV

Cheese

1551

Forcinio (H). **Package of the year takes microwavability to new frontier**. *Prepared Foods* 162(5); 1993; 37

A single-serve, microwaveable pouch pack for cheese toppings is described. The pouch is made of layers of polyester, PVC (for barrier) and polypropylene (for sealability and heat resistance) and contains a layer of flexible extruded polystyrene foam that prevents

fingers from being burnt during handling after the product comes out of the microwave. To heat, the spout is opened and the pack is microwaved for 30-40 seconds. As the contents warm, the steam escapes through the spout. After microwaving, the consumer can fold the pouch to squeeze the contents out. The product has a 6-month shelf-life. BV

Domiat cheese

1552

El-Samragy (YA), Shehata (AE), Foda (MI) and Khorshid (MA). **Effect of salt on the production of citric acid from whey as a means for pollution control in Domiat cheese manufacture.** *Dairy, Food and Environmental Sanitation* 13(11); 1993; 638-641

The chemical oxygen demand (COD) and biological oxygen demand (BOD) of salt whey can be markedly reduced upto 77.8 and 76.3% respectively via bioconversion of whey into citric acid (CA) by *Asp. niger* CAIM 111 and CAIM 167 when the pH is adjusted to 3.5 and methanol is added at a level of 4%. Also, deproteinization of whey prior to fermentation is important to maximize the reduction of pollutant load of this by-product. Study showed that using salt whey, the by-product of the manufacture of Domiat cheese, as a substrate for the production of CA by *Asp. niger* can be considered as a possible technique for utilizing whey for a beneficial purpose as well as a pollutant load reducer. BV

Leben

1553

Jandal (JM). **Physical, chemical and biochemical studies on Leben in Salah Al-ddin province area.** *Beverage and Food World* 21(4); 1994; 11-12

The av. % of total solids, moisture, acidity, fat, protein, casein, lactose, total ash, Ca, Mg, P, Na and chloride in Leben (fermented milk product) were 13.25, 86.75, 1.16, 3.61, 2.94, 4.5, 0.89,

0.212, 0.025, 0.084, 0.121, 0.243 respectively. BV

Wheys

1554

Shilpa (Vij) and Gandhi (DN). **Whey - an alternative substrate for the production of baker's yeast.** *Indian Food Industry* 12(5); 1993; 41-43

Role of yeast in bread making, production of baker's yeast from whey and production of non-conventional baker's yeast are the aspects presented in this article. CSA

Milk proteins

1555

Britten (M) and Giroux (HJ). **Interfacial properties of milk protein-stabilized emulsions as influenced by protein concentration.** *Journal of Agricultural and Food Chemistry* 41(8); 1993; 1187-1191

Interfacial area, protein load and interfacial energetics of emulsions produced from sodium caseinate (CAS) and whey protein isolate (WPI) were determined. Protein concn. in the aqueous phase varied from 0.125 to 1%. At low concn., WPI emulsions had larger interfacial areas (smaller oil droplets) than CAS emulsions. For concn. greater than 0.5% the reverse trend was observed. Protein load increased with protein concn., but levelled off at a concn. of 0.5% for WPI emulsions. From contact angle measurements on hydrated layers, interfacial interaction energy between oil droplets was calculated. As protein concn. increased, the short-range polar (AB) contribution to interaction energy became repulsive while the long-range nonpolar contribution remained attractive. The degree of orientation of the hydration layer was calculated from the AB contribution to oil droplet surface energy. Increasing protein concn. reduced water molecule orientation at the surface of oil droplets. The hydration layer of CAS-stabilized oil droplets showed a lower degree of orientation than the hydration layer of WPI-stabilized oil droplets. Results are discussed in relation to emulsion stability. AA

Whey proteins

1556

Nonaka (M), Li (C-E) and Nakai (S). **Raman spectroscopic study of thermally induced gelation of whey proteins.** *Journal of Agricultural and Food Chemistry* 41(8); 1993; 1176-1181

α -Lactalbumin and β -lactoglobulin solutions (15% (w/v) in D₂O, pD 6.8, 20mM NaCl) were heated at 50, 70 or 90°C for 30, 60 or 90 min. Only samples heated at 90°C formed transparent gels. The amide I' and amide III' bands of the Raman spectra implicated an increase of β -sheet structure with a simultaneous decrease of helical structure in heated α -lactalbumin, while an increase of β -sheet with a simultaneous decrease of turn structure was suggested in heated β -lactoglobulin. Changes in other regions of the Raman spectra could be interpreted as changes in disulphide conformation as well as in microenvironment around several amino acid residues, i.e. Trp, Tyr and His. These changes were observed after heating at 70 and 90°C but were more intense in gelled (90°C) than in ungelled samples and in β -lactoglobulin than in α -lactalbumin. Observations are in accord with the fact that β -lactoglobulin forms gels much more easily than α -lactalbumin. AA

MEAT AND POULTRY

1557

Lee (W-O). **Monitoring synthetic hormone residues in food: The Hongkong experience.** *ASEAN Food Journal* 9(1); 1994; 13-16

Oestrogenic hormones, both synthetic and natural, are used as anabolic agents in animal husbandry for wt. gain and feed efficiency of feedstocks. Carcinogenicity and other adverse health effects of these hormones are observed and has been banned in most countries throughout the world. The method reported comprises HPLC for the detn. of synthetic hormone residues and the use of several techniques including GC-MS, Fourier transform infrared spectrophotometry and

high performance TLC for further confirmation. BV

Meat

1558

Sharma (BD), Padda (GS) and Yadav (PL). **Development of gravy base for meat curry.** *Beverage and Food World* 21(4); 1994; 7-8, 12

Development of a suitable gravy base with balanced ingredients and good storage quality is necessary for convenience and speed of curiry preparation. Results of the study indicated that onion, garlic, and ginger (60:2:2) mix, tomato paste, oil, dry spices, salt, curd and maida as ingredients in the right proportion for the preparation of an acceptable gravy. The gravy could be packed alone or with meat balls in polypropylene (150 guage) pouches and stored safely for 15 days at refrigerated temp. and 90 days in frozen condition. Storage of gravy with meat balls had better shelf-life as compared to gravy alone. BV

1559

Vorster (SM), Greebe (RP) and Nortje (GL). **The incidence of *Listeria* in processed meats in South Africa.** *Journal of Food Protection* 56(2); 1993; 169-172

1560

Maijala (RL), Eerola (SH), Aho (MA) and Hirn (JA). **The effect of GDL-induced pH decrease on the formation of biogenic amines in meat.** *Journal of Food Protection* 56(2); 1993; 125-129

The effect of pH on formation of biogenic amines has been studied mainly in broths in which pH has been fixed before incubation. In the fermentation of dry sausage, pH rapidly decreases from the initial value to a certain level. Glucono-delta-lactone (GDL) was used to decrease pH in meat. 6 minced meat samples were each divided into 3 portions with 0, 0.5 or 1.0% GDL added. Samples were incubated at 20-22°C for 7 days. Amounts of biogenic amines (histamine, tyramine, putrescine, cadaverine, phenylethylamine, tryptamine, spermine and spermidine) as well as pH, aw and bacterial counts of lactic acid bacteria, faecal streptococci, coliforms and total plate

count were measured. Addition of GDL resulted in a significant decrease in pH and in level of histamine and putrescine as well as in levels of faecal streptococci and coliforms, and total plate counts. Of 87 faecal streptococci, 7 *Enterococcus faecalis* strains produced tyramine. All coliforms and related strains isolated from violet red bile agar produced tyramine, putrescine and cadaverine on agar plates. The proportion of histamine-positive strains, especially *Hafnia alvei*, increased from 0 to 57% during incubation. The rate and level of pH decrease affected amine formation in meat, indicating that levels of, e.g. histamine produced could be decreased by optimizing the pH decrease during fermentation. Addition of GDL facilitates study of effects of pH decrease without interactions between the starter culture and contaminant flora. AA

1561

Teltumbade (SS), Sherikar (AT), Waskar (VS) and Sherikar (AA). **Detection of residual pencillins in meat employing *Bacillus stearothermophilus* disc assay.** *Indian Journal of Animal Science* 64(7); 1994; 774-777

Meat (117 samples) from different sources were analysed for β -lactum and other inhibiting residues. Modified method was used for screening and confirmation of β -lactum residues in buffalo and chicken meat using penicillinase enzyme. The birds treated with ampicillin trihydrate and procaine penicillin exhibited β -lactum residues in their tissues. Higher values of β -lactum and other inhibiting residues in buffalo meat (15.84%) as compared to those reported from bovines slaughtered abroad were attributable to slaughter of animals, which had probably received prolonged treatments for chronic ailments. Similarly, the excessive use of antibiotics as growth promoters and feed additives in broilers resulted in higher percentage (18.75%) of antibiotics. The present work indicates an urgency to advocate rational use of antibiotics in animals for safeguarding the human health and the enforcement of standards as important in protecting public health. AA

Beef

1562

Lourdes (B-M) and Soares (ME). **Effect of cooking on diazepam and its metabolites in liver of bulls.** *Journal of Agricultural and Food Chemistry* 41(6); 1993; 965-967

1563

Jericho (KWF), Bradley (JA), Gannon (VPJ) and Kozub (GC). **Visual demerit and microbiological evaluation of beef carcasses: methodology.** *Journal of Food Protection* 56(2); 1993; 114-119

A repeatable, automated method was developed for estimating aerobic bacterial populations on surfaces of groups of beef carcasses. 10 sample cluster sites (CS) were identified by localizing visual demerits (Canadian Streamlined Inspection System) on 200 carcasses at 1 plant. Most probable number growth units/cm² (MPNGU/cm²) on hydrophobic grid membrane filters (HGMPF) were assessed by an automated HGMPF interpreter for excision samples from the centres of the CS. Between-sample variation of greater than 90% of the total log₁₀ MPNGU/cm² variance indicated good repeatability between HGMPF of the same sample and interpretations of the same HGMPF. Variance component estimates indicated that there was considerable variation in MPNGU/cm² between carcasses and between paired adjacent samples for a CS. A statistically significant but weak association was found between the demerit scores of a CS and MPNGU at its centre. The variance component estimates will be used to estimate the sample required for future group-carcass evaluations. AA

1564

Hogue (AT), Dreesen (DW), Green (SS), Ragland (RD), James (WO), Bergeron (EA), Cook (LV), Pratt (MD), Martin (DR). **Bacteria on beef briskets and ground beef: correlation with slaughter volume and antemortem condemnation.** *Journal of Food Protection* 56(2); 1993; 110-113, 119

Aerobic plate counts of 3455 brisket and 1370 beef mince samples were examined for association with slaughter vol. in 547 US beef slaughter establishments. High vol. beef slaughter establishments control total aerobic

bacteria counts on briskets and beef mince more effectively than small vol. establishments. The lower aerobic plate counts at high slaughter vol. may have resulted from uniformity of cattle slaughtered, specialization of labour, measures taken to prevent contamination and effective decontamination of carcasses in high vol. slaughter establishments. Prevalence of *Salmonella* contamination was found to be more closely associated with health of animals brought to slaughter than with conditions in slaughter establishments. Prevalence of contamination of brisket and beef mince samples with *Salmonella* was highest in calf slaughter establishments. *Salmonella* contamination on brisket samples increased as antemortem condemnation increased in establishments that slaughter calves. No association was found between *Salmonella* contamination and slaughter vol. AA

1565

Grau (FH) and Vanderlinde (PB). **Aerobic growth of *Listeria monocytogenes* on beef lean and fatty tissue: equations describing the effects of temperature and pH.** *Journal of Food Protection* 56(2); 1993; 96-101

The aerobic growth rate and duration of the lag period were determined for *L. monocytogenes* strain Murray B growing on lean beef mince and on pieces of fatty tissue. The organism grew at 0°C on lean tissue at pH greater than or equal to 6 and on fatty tissue. It failed to grow at 0°C on lean at pH 5.6 but did grow at 2.5°C. Effect of temp., between 0 and 30°C, on the growth rate on fatty tissue can be described by a modified Arrhenius equation, which accounted for 99.7% of the variance. An equation is also presented for describing the combined effect of temp. and pH on growth rate on beef lean (variance accounted for 99.5%). For lean at about pH 5.5-5.6, this equation applied between about 2.5 and 35°C; for lean of pH 6-7, it applied between about 0 and 35°C. Though the lag period increased with decrease in temp. and pH, measured lag times were more variable than generation times, and the goodness of fit of modified Arrhenius equations to lag times was relatively poor (for 83-92%). AA

1566

Talaat (El-K), Yousef (AE) and Ockerman (HW). **Inactivation and attachment of *Listeria monocytogenes* on beef muscle treated with lactic acid and selected bacteriocins.** *Journal of Food Protection* 56(1); 1993; 29-33

Cubical pieces (1 cm³) of aseptically obtained beef muscle were treated with lactic acid (2%), nisin (4 x 10⁴ IU/ml) and pediocin PO2 (a bacteriocin produced by *Pediococcus acidilactici* PO2; 3.2 x 10³ arbitrary units/ml). Treated meat was immersed for 1 min in a cell suspension of a mixture of 2 strains of *Listeria monocytogenes* and then stored for 48 h at 4°C. Meat cubes were analysed immediately after immersion in the cell suspension, then after 1, 24 and 48 h of storage. Count of *L. monocytogenes*/cube and % of attached cells were determined. Data indicated that the antimicrobial agents significantly (P = 0.05) decreased the count of *L. monocytogenes* during the 48-h storage by 1.7, 1.1 and 0.6 log10 cfu/6 cm² of meat surface for lactic acid, nisin and pediocin PO2 treatments, respectively. Lactic acid on the meat surface had both immediate and delayed listericidal action, but bacteriocins inhibited *L. monocytogenes* immediately, and had little or no delayed antilisterial effect. Percentage of *Listeria* cells attached to beef muscle significantly (P = 0.05) increased in the presence of lactic acid, but the value did not change significantly or slightly decreased in the presence of nisin and pediocin PO2, respectively. AA

Mutton

Goat

1567

Tahir (MA-H), Abdulla (A-HH) and Al-Jassim (AF). **Effect of castration and weight at slaughter on carcass traits and meat quality of goat.** *Indian Journal of Animal Science* 64(7); 1994; 778-782

Iraqi indigenous black male goat kids (9 castrated and 9 intact) were slaughtered at body wt. of 18.5 and 24.5 kg. Live body wt., body organ wt. and their percentages of live wt. were not affected significantly by castration

except that for the per cent of head and pelt. Animals slaughtered at 24.5 kg wt. produced significantly higher ($P < 0.01$) wts. for head, feet, pelt and full alimentary tract. Castration had no significant effect on carcass wt., dressing percentage, carcass measurements, rib-eye muscle area and wt. of kidney fat, except that the wt. of caul fat in the castrated animals was heavier than that of intact males. Carcass wt. and dressing percentages were higher ($P < 0.05$) in animals slaughtered at 24.5 kg live wt. Carcass major cut wt. and percentages were not influenced by castration. Animals slaughtered at heavier wt. produced significantly heavier carcass major cuts, while their percentages of chilled carcass wt. were not influenced. Wt. of animal at slaughter did not affect taste panel evaluation of meat. Moreover, flavour, juiciness, tenderness and overall satisfaction of meat samples from castrated animals gained higher ($P < 0.01$) evaluation scores compared with that of intact male goats. AA

Sheep

Lamb

1568

Rivas (T), Herrera (A) and Arino (A). **Assessment of an excision surface sampling method for microbiological analysis of lamb liver.** *Journal of Food Protection* 56(1); 1993; 58-61

Reproducibility of an excision surface sampling method for microbiological analysis of 204 samples of spoiled and nonspoiled lamb liver was studied. The procedure consisted of removing a 5 cm^2 area from the liver (1-2 mm thick) with sterile scalpel and metal templates. Since variation was observed in thickness of the excised portions taken from different livers, all excised samples were weighed and results for microbiological analysis (aerobic plate counts at 30 and 7°C , *Enterobacteriaceae*, *Pseudomonas* and lactic acid bacteria counts) were expressed as both $\log \text{cfu/cm}^2$ and $\log \text{cfu/g}$. For all groups of microorganisms studied, in both spoiled and nonspoiled samples, a highly significant correlation was found ($r > 0.996$, $P < 0.0001$) between results expressed as $\log \text{cfu/cm}^2$ and $\log \text{cfu/g}$. AA

Pork

1569

Narasimhan Ramarathnam, Rubin (LJ) and Diosady (LL). **Studies on meat flavor. III. A novel method for trapping volatile components from uncured and cured pork.** *Journal of Agricultural and Food Chemistry* 41(6); 1993; 933-938

Volatile components from uncured (UCP) and cured pork (CP) were trapped onto a solid adsorbent (Florisil cartridge) and in an organic solvent (pentane) using the nitrogen purge-and-trap (NPT) technique. 32 compounds not previously reported were identified. Meat flavour concentrates prepared by the NPT method showed the presence of heterocyclic and phenolic constituents not detected in the aroma concentrates prepared using continuous steam distillation-extraction. Of the 26 compounds that were found only in the uncured-pork aroma concentrates, 2-methyl hexanal, tetrahydro -cis- 2,4-dimethyl furan, 3-propyl- 1H-1,2,4-triazole, 4-methyl- 1-decene, nonylcyclo propane, 5-propyl decane, 1,3- dimethoxy benzene, (1,1-dimethylethyl)-4- methoxy phenol, 3-amino-5,6-dimethyl triazolo [4,3- α] pyrazine, 2-butyl phenol and bis(2-ethylhexyl) phthalate were newly identified. Only the 2 newly identified components 2-methylcyclopentanol and 2-butyl-2-octenal were identified uniquely in the aroma concentrates of cured pork. BV

1570

Knudtson (LM) and Hartman (PA). **Enterococci in pork processing.** *Journal of Food Protection* 56(1); 1993; 6-9, 17

Numbers and species of enterococci encountered on pork carcasses during different stages in the slaughter process as well as on pork products were determined. 3 hog slaughtering plants were surveyed, each 3 times at 4 processing points. Each swine carcass was swabbed at 2 sites. Specimens were plated on KF streptococcal agar and fluorescent gentamycin-thallous-carbonate agar. Retail and spoiled pork sausage products were also examined. Isolates were speciated by

using the API Rapid Strep and Baxter MicroScan Pos ID panels. Contamination levels varied between plants as the carcasses progressed down the processing line; highest counts were obtained directly before packaging in plants A and C. The highest count for plant B occurred at the first stage of sampling. More *Enterococcus faecalis* than *E. faecium* were isolated from the pork carcasses. Pork sausage results are also presented [fresh sausage samples contained the same enterococci spp. as swine carcasses; spoiled sausages contained mainly *E. faecium* with lesser amounts of *E. faecalis*]. It was concluded that enterococci are useful as an indicator of pork sanitation and to detect critical control points during processing. In some instances, high levels of enterococci were associated with spoilage of pork sausage. AA

Products

1571

Dornblaser (L). **Meat makers market deli freshness.** *Prepared Foods* 162(5); 1993; 93-94

New product introductions in the processed meat category in the US are discussed. 785 processed meat, poultry and seafood items were introduced in 1991. Aspects considered include: 'deli'-style combination meat packs; low-calorie and low-fat meats; lunchtime meat products; low-fat sausages; ready-to-cook fish; breaded seafoods; meat alternatives (vegetarian burgers); and venison and buffalo products. BV

Poultry

1572

Stavric (S) and D'Aoust (JY). **Undefined and defined bacterial preparations for the competitive exclusion of *Salmonella* in poultry - a review.** *Journal of Food Protection* 56(2); 1993; 173-180

Competitive exclusion, as a method for controlling *Salmonella* in poultry, has been studied. Under lab. conditions, undefined preparations cultured from faecal and caecal microflora have reduced the prevalence of infected chicks following exposure to a standard dose of *Salmonella*. Use of undefined

cultures and the effectiveness of defined cultures are discussed, under the headings: The scope of the problem; and Competitive exclusion (Treatment with undefined mixtures and Treatment with defined cultures). It is concluded that competitive exclusion may provide a useful adjunct to help reduce *Salmonella* in poultry. Review with 103 references. CSA

1573

Abouzied (MM), Cheng (H-W), Pestka (JJ) and Smith (DM). **Lactate dehydrogenase as safe endpoint cooking indicator in poultry breast rolls: development of monoclonal antibodies and application to sandwich enzyme-linked immunosorbent assay (ELISA).** *Journal of Food Protection* 56(2); 1993; 120-124, 129

An ELISA was developed to detect lactate dehydrogenase (LDH) as a marker protein for verifying endpoint cooking of uncured poultry products. Monoclonal antibodies were prepared against chicken muscle LDH and used with rabbit polyclonal antibodies developed against turkey or chicken muscle LDH for capture and detection in the assay, respectively. Min. assay detection limits for turkey and chicken muscle LDH were 1 ng/ml. Turkey and chicken muscle LDH, but not LDH from other spp., cross reacted in the ELISA. The ELISA was further verified using extracts of turkey breast rolls processed to internal temp. between 68.3 and 72.1°C. LDH content of extracts diluted 3- to 6-fold was less than 15 ng/ml for turkey rolls processed to 70.9 and 72.1°C. At a 6-fold dilution, LDH content of extracts from rolls processed to 69.7°C was approx. 10x greater than those processed to 70.9°C. A survey of market precooked poultry products indicated assay validity with precooked turkey roast, but not turkey hams with max. internal temp. requirements of 68.3°C. Results suggested the ELISA was applicable for determining whether turkey breast rolls are processed to the required USDA endpoint temp. of 71.1°C. AA

1574

Samoon (AH) and Sahoo (J). **Mechanically deboned poultry meat: Quality aspects and its utilization by Indian meat industry.** *Indian Food Industry* 12(3); 1993; 23-26

This article briefly highlights the origin and significance of mechanically deboned poultry meat (MDPM), different models of mechanical deboners, yield and composition of MDPM, protein quality and cholesterol levels of MDPM products, MDPM vs. product development, microbial quality and shelf-life aspects of MDPM. CSA

Chickens

1575

Kondaiah (N), Anjaneyulu (ASR), Lakshmanan (V), Singh (RP) and Panda (B). **Meat and byproduct yield from different commercial classes of chicken.** *Indian Journal of Animal Science* 63(3); 1993; 360-362

1576

Chuaqui (O-N), McDougall (TE) and Guerrero (AM). **Validation of o-tyrosine as a marker for detection and dosimetry of irradiated chicken meat.** *Journal of Food Protection* 56(1); 1993; 47-50

o-Tyrosine has been proposed as a marker for postirradiation identification of food that contains protein. Validity of using o-tyrosine for this purpose was tested and established. The validation process involved examination of background levels of o-tyrosine in unirradiated chicken, radiation dose yield, postirradiation storage, dose rate, radiation type, temp. during irradiation, and O₂ concn. during irradiation. o-Tyrosine was present in unirradiated chicken meat at variable levels. However, these background levels were low enough that o-tyrosine can serve to determine whether chicken has been irradiated or not at the commercially approved doses (3 kGy). The radiation dose response curve for formation of o-tyrosine was linear. Apparent yields may vary with the analytical method used; however, it was independent of the dose rate, radiation type, atmosphere, and temp. (above freezing) during irradiation. It was also independent of storage time and temp. after irradiation. It was concluded that this marker can be used to determine the absorbed dose in chicken meat irradiated with either gamma rays or electrons under normal or modified atmospheres. AA

Broilers

1577

Singh (HS) and Sud (SC). **Effect of geriforte on carcass characteristics and meat quality of broilers.** *Indian Journal of Animal Research* 27(1); 1993; 32-34

Effect of geriforte at 3 different dose levels 0.09, 0.26 and 0.45 g/kg feed was studied on a day-old broiler chicks of one hatch, 57 in each group and another control group. Birds were sacrificed at 72 days of age. Live wt. (39%), hot dressed wt. (2%), head, legs, heart, liver, eviscerated wt. (6%) and total ready-to-cook wt. (4%) increased and Giblet wt. (12%) decreased significantly in 0.26 g/kg feed group. Moisture and fat % of the carcass did not differ among various groups. The protein content was significantly higher in treated groups compared to control. The drug at 0.26 g/kg feed increased the feed utilization in broilers. AA

Turkeys

1578

Lee (MB). **The reliability of pop-up timers in turkeys.** *Dairy, Food and Environmental Sanitation* 13(11); 1993; 628-630

Study examines the usefulness of an alternative to the meat probe, namely the "pop-up" timer, in determining turkey doneness. This 2 piece plastic device, composed of a stick like shaft within a golf-tee like frame, 4.5 cm long. When a powder within the frame melts at about 82°C a coiled spring is released and the shaft pops up. The now raised shaft indicates that the turkey is cooked. BV

Products

Eggs

1579

Elkin (RG), Freed (MB), Kieft (KA) and Newton (RS). **Alteration of egg yolk cholesterol content and plasma lipoprotein profiles following administration of a totally synthetic HMG-CoA reductase inhibitor to laying hens.** *Journal of Agricultural and Food Chemistry* 41(7); 1993; 1094-1101

1580

Yang (TS) and Cunningham (FE). **Stability of egg white lysozyme in combination with other antimicrobial substances.** *Journal of Food Protection* 56(2); 1993; 153-156

The effects of pH, ionic strength and selected antimicrobial substances on the lytic activity of egg white lysozyme over 30 days were studied by observing the rate of clearing of a cell suspension of *Micrococcus lysodeikticus*. During prolonged storage, lysozyme activity remained relatively stable at pH 7 and ionic strength < 0.10, whereas lower activity ($P < 0.05$) was observed at pH 9 and ionic strength > 0.14. Lysozyme activity was highly stable (i.e. maintained over 90% of lytic activity from day 1 to day 30) in 1.0% NaCl, 100 p.p.m. sodium nitrite, 4.0% ethanol and 100 p.p.m. BHT. Lysozyme activity was also stable (i.e. retained over 80% of lytic activity) in 0.1% sodium benzoate and 100 p.p.m. BHA. The lysozyme activity was relatively stable (i.e. retained over 70% of lytic activity) in sol. of 0.3% calcium propionate, 0.1% potassium sorbate and 0.1% propyl paraben. Approx. 50% of the lysozyme activity was retained in 0.5% EDTA. Activity was lost when lysozyme was combined with 0.5% lactic acid, 4% acetic acid and 100 p.p.m. chlorine water. AA

1581

Gast (RK). **Recovery of *Salmonella enteritidis* from inoculated pools of egg contents.** *Journal of Food Protection* 56(1); 1993; 21-24

To determine whether *Salmonella enteritidis* (SE) could be efficiently detected in pools of egg contents, eggs were inoculated with small numbers of SE and the contents of 10 or more eggs were mixed together. After these pools were incubated, samples were transferred to culture media for isolation and identification of SE. Incubation (at 25 or 37°C) of inoculated egg pools for at least 4 days before culturing resulted in a significant increase in frequency of recovery of SE. Following inoculation of 10-egg pools with approx. 50 cfu, SE was recovered from 11% of pools before incubation and from 94% of incubated pools. Following inoculation of 10-egg pools with approx. 5 cfu, SE was recovered from none of the pools before

incubation and from up to 72% of incubated pools. Increasing the size of pools (from 10 to 30 eggs) did not significantly affect frequency of isolation of SE, but reducing the sample vol. transferred from incubated egg pools to culture media (from 20 to 2 ml) led to a significant decrease in SE recovery. At the lower (2 ml) transfer volume, frequency of recovery of SE was not improved by nonselective preenrichment of samples. AA

SEAFOODS

1582

Todd (ECD). **Domoic acid and amnesic shellfish poisoning - a review.** *Journal of Food Protection* 56(1); 1993; 69-83

Amnesic shellfish poisoning, associated with consumption of mussels, is reviewed in the article. Emphasis is placed on the role of domoic acid. Aspects covered are: chronology of the 1987 outbreak in Prince Edward Island (PEI), Canada (description of cases, deaths); development of a specific mouse bioassay for the toxin; isolation and identification of the toxin (domoic acid); testing of shellfish and clinical specimens for domoic acid; detn. of the amount of domoic acid ingested during the PEI outbreak; experimental toxicity in rodents and primates; mechanism of toxicity in the brain; links between animal studies and human intoxication; treatment of cases; definition and name of the clinical syndrome; nature of the mussel industry in PEI; *Nitzschia pungens* f. *multiseries* as a possible source of the toxin; *Nitzschia* blooms in eastern PEI in 1988 and 1989; other sources of domoic acid; uptake and depuration of domoic acid by shellfish; issues associated with extended sampling; the paralytic shellfish poisoning-domoic acid monitoring programme; acceptable levels of domoic acid in shellfish; and future research. 134 references. CSA

Sea urchin

1583

Shimada (K), Nakagawa (S), Hotta (K), Shibata (K) and Yagi (T). **Effect of processing and storage on the fate of vitamins B₁, B₂, and B₆ and nicotinamide of sea urchin gonads.**

Sea urchin gonads (SUG) were dehydrated by standing for several h at 4°C. Half the dehydrated gonads were steamed to inactivate B vitamin degrading enzymes. Steamed and unsteamed SUG were mixed with NaCl (7% w/w) prior to addition of ethanol (10% w/w). Processed SUG were stored in sealed containers at room temp. for up to 180 days. Changes in B vitamin contents were monitored during processing and storage. Thiamin, which accounted for 90% of B1 vitamers in raw SUG, was degraded during processing and storage. FAD was the major B2 vitamer in raw SUG and was hydrolysed, enzymically, to riboflavin during the first 15 days of storage in unsteamed SUG (no changes were observed in steamed SUG). Vitamin B2 content decreased from 1.49 to 0.81 µmol/100 g SUG during 180 days of storage. Pyridoxal 5'-phosphate was the predominant B6 vitamer in raw SUG. It was converted to pyridoxamine 5'-phosphate during steaming and pyridoxal and pyridoxamine during other processes. 67.5% of vitamin B6 was lost during storage. Nicotinamide levels remained fairly constant throughout storage; this was probably due to a balance between chemical losses and release of bound forms. BV

Shrimp

1584

Kantt (CA) and Torres (JA). **Growth inhibition by glucose oxidase of selected organisms associated with the microbial spoilage of shrimp (*Pandalus jordani*): in vitro model studies.** *Journal of Food Protection* 56(2); 1993; 147-152

The effect of glucose oxidase (GOX)-catalase with different GOX-catalase ratios and of the chemicals produced by GOX, gluconic acid and hydrogen peroxide, were evaluated on 4 spoilage microorganisms associated with shrimp. Growth inhibition was independent of the enzyme ratio within the limits tested. Hydrogen peroxide inhibited *Pseudomonas fluorescens*, *Hansenula polymorpha* and *Acinetobacter calcoaceticum*. Only *Corynebacter aqualicum* was inhibited by

gluconic acid but was not affected by hydrogen peroxide. AA

Fish

Crawfish

1585

Dorsa (WJ), Marshall (DL), Moody (MW) and Hackney (CR). **Low temperature growth and thermal inactivation of *Listeria monocytogenes* in precooked crawfish tail meat.** *Journal of Food Protection* 56(2); 1993; 106-109

Growth of *L. monocytogenes* in precooked crawfish tail (CFT) meat at 0, 6 and 12°C was determined. Thermal death times were also determined. Growth curves for *L. monocytogenes* revealed that little multiplication occurred during storage at 0°C for 20 days. At 6 and 12°C, exponential growth began immediately with no observed lag phase. Generation times of 72.2, 17.0 and 6.9 h were calculated at 0, 6 and 12°C, respectively. Observed D values at 55, 60 and 65°C were 10.23, 1.98 and 0.19 min, respectively. The z value for *L. monocytogenes* in precooked CFT meat was calculated to be 5.5°C. Results indicate that a refrigeration temp. of 6°C (42.8°F) will support *L. monocytogenes* growth and short-term temp. abuse at 12°C will induce very rapid growth of the organism on CFT meat. Observed thermal treatment values can be used to establish postpicking heat treatments to eliminate *L. monocytogenes* from packaged CFT meat prior to retail sale. AA

PROTEIN FOODS

1586

Dornblaser (L). **Healthy claims make healthy gains.** *Prepared Foods* 162(5); 1993; 8-9

Dietetic foods, i.e. low-calorie, low-fat, all-natural, reduced-sodium, high fibre, reduced-sugar, added calcium and organic, introduced onto the US market in 1992 are discussed. Aspects considered include: effect of the National Labeling and Education Act on health claims; low fat product introductions;

low cholesterol foods (companies did not promote the low cholesterol benefits of foods as much as in previous years); 'lite' products; natural, additive-free products; organic foods (increased 38% to 510 new products from 370 in 1991); sodium-reduced foods (reduced sodium claims made in conjunction with cholesterol-, calorie- and fat-reduction claims); foods containing sugar substitutes; calcium enriched foods; and foods containing added fibre (few foods were introduced in this category). BV

Infant foods

1587

Dornblaser (L). **Baby foods toddle along.** *Prepared Foods* 162(5); 1993; 47

New food products introduced for infants in the US in 1992 are discussed. 53 new infant food introduced were reported. Aspects discussed include: products specifically for toddlers; microwaveable main dishes; organic dinners in jars; combined fruit and vegetable juices; shelf-stable concentrates; yoghurt breakfasts; low acid juices; and soy-based formulas. BV

ALCOHOLIC AND NON-ALCOHOLIC BEVERAGES

1588

Hertog (MGL), Hollman (PCH) and Putte (BVande). **Content of potentially anticarcinogenic flavonoids of tea infusions, wines, and fruit juices.** *Journal of Agricultural and Food Chemistry* 41(8); 1993; 1242-1246

Contents of the potentially anticarcinogenic flavonoids quercetin, kaempferol, myricetin, apigenin and luteolin in commonly consumed beverages were determined by reversed-phase HPLC with UV detection. Flavonoid levels in beer, coffee, chocolate milk and white wine were < 1 mg/l. 12 types of tea infusion, 6 types of wine, apple juice, tomato juice, grape juice, orange juice, grapefruit juice and lemon juice were analysed. Luteolin and apigenin were not detected in any of the beverages. In red wines and grape juice, quercetin and myricetin levels varying from 4 to 16 mg/l and from 7 to 9 mg/l,

respectively, were detected. Quercetin levels in fruit juices were generally less than 5 mg/l except for lemon juice (7 mg/l) and tomato juice (13 mg/l). In black tea infusions quercetin (10-25 mg/l), kaempferol (7-17 mg/l) and myricetin (2-5 mg/l) were detected. Flavonoid levels in green tea were comparable to those in black tea. The flavonoid content of tea prepared with tea bags was generally higher than that of tea prepared with loose leaves. Together with data on flavonoid contents of vegetables and fruits published previously [J. Agric. Fd Chem. 40, 1992, 2379], results provide a base for an epidemiological evaluation of the potentially anticarcinogenic effects of flavonoids. AA

1589

Davis (S). **The new beverage choice is crystal clear.** *Prepared Foods* 162(5); 1993; 57, 59, 61

Development of new products in the beverages category in the US in 1992 is described. Number of new beverages increased was 12.5% over that from 1991. Trends included increased numbers of clear beverages, bottled waters, ready-to-drink iced teas, and sparkling flavoured drinks. BV

Alcoholic beverages

Wines

1590

Borja (R), Martin (A), Luque (M) and Duran (MM). **Kinetic study of anaerobic digestion of wine distillery wastewater.** *Process Biochemistry* 28(2); 1993; 83-90

Non-alcoholic beverages

Fruit juices

1591

Rai (T), Bajaj (VK) and Singh (S). **Application of membrane processing for concentration of fruit juices.** *Beverage and Food World* 21(4); 1994; 13-14, 31

The application of membrane processing (MP) may produce fruit juice conc. of desirable quality at low cost. In a single step MP perform

juice clarification and fining, which are otherwise accomplished in traditional process in multiple steps involving the use of fining agents enzymes and centrifugation. During concn. of fruit juices by evaporation, much of essence, various volatile alcohols, esters and aldehydes are lost while there has been no loss in the quality and overall aroma and flavour of membrane concentrated fruit juice. MP of fruit juice require significantly less energy / pound of the removal of water. SRA

1592

Anon. **Tropical fruits pack a punch.** *Prepared Foods* 162(6); 1993; 64-65

Use of tropical fruits in processed foods and beverages is discussed. In 1992, a 20.2% increase over 1991 in the number of foods and beverages introduced that included mango, passion fruit, guava or banana on their label was observed. Aspects discussed include: reliable, consistent sources of tropical fruits; quality control of fruits; documentation of the use of agricultural compounds on the fruit; fruit inspection; separation of juice; nutritional properties of tropical fruits; flavour properties; use in beverages and processed foods; demand for tropical fruit-containing foods in Europe; and growth potential in the US. BV

Kinnow mandarin juices

1593

Khurdiya (DS) and Lotha (RE). **Effect of blending of Kinnow mandarin juices on the quality of the blend juice and nectar.** *Indian Food Packer* 48(3); 1994; 41-45

Blended juice and nectars of Kinnow mandarin fruits were prepared using juice extracted by hydraulic pressing (HP) and crushing with peel (CP) method. Juice of CP was blended with the juice of HP ranging from 10 to 50%. Nectar containing 40% juice, 15°Brix and 0.3% acidity was prepared and heat processed. Juice yield was 46 and 48.4% from HP and CP methods respectively. When the HP juice having a lower TSS (10.4%) and the CP juice with a higher TSS (12.3%) were blended, TSS increased with proportion of CP juice. GS

Mango juices

1594

Seshadri (KS), Gowramma (RV), Mahadeviah (M), Kumar (KR) and Mahendrapandian (S). **Packaging of mango juice in flexible packaging material.** *Indian Food Packer* 48(3); 1994; 25-29

Mango juice packed in stand up pouch (metallised polyester/HD-LD coextruded) to find its suitability compared to tin plate container were stored under 3 conditions (1) refrigerated condition 4°C (2) 27°C/65% RH (ambient condition); and (3) 38°C/90% RH. Sensory evaluation of juice indicated that stand up pouch gave a shelf life of 60 days under refrigerated condition, 45 days under ambient condition and 30 days under 38°C/90% RH. AA

Raspberries juices

1595

Rommel (A) and Wrolstad (RE). **Influence of acid and base hydrolysis on the phenolic composition of red raspberry juice.** *Journal of Agricultural and Food Chemistry* 41(8); 1993; 1237-1241

Acid [2N HCl, 30 min, boiling] and base [2N NaOH, 2 h, room temp.] hydrolysis simplified the complex HPLC profile of red raspberry juice phenolics. In 3 acid-hydrolysed juices, ellagic acid, 2 unidentified ellagic acid compounds, and gallic, p-hydroxybenzoic, protocatechuic, caffeic, p-coumaric and ferulic acids, as well as (+)-catechin, (-)-epicatechin, quercetin and kaempferol were separated and identified using HPLC diode array spectral techniques. The % of HPLC peak area for these phenolics were similar in acid-hydrolysed juices. In base-hydrolysed samples the same phenolics, except the 2nd ellagic acid compound, were present and the 1st ellagic acid compound was present in smaller quantity. Sep-Pak C18 cartridges were used for sample preparation. Hydrolysis could be a useful tool for screening of raspberry juices for qualitative deviations from authentic HPLC profiles to determine adulteration by other fruit juices or phenolic mixes. AA

Tea

1596

Muroi (H) and Kubo (I). **Combination effects of antibacterial compounds in green tea flavour against *Streptococcus mutans*.** *Journal of Agricultural and Food Chemistry* 41(7); 1993; 1102-1105

Combinations of green tea flavour compounds with indole were tested for antibacterial activity against *Streptococcus mutans*, a bacterium responsible for causing dental caries. Synergism was found in the combination of sesquiterpene hydrocarbons (δ -cadinene and β -caryophyllene) with indole; their bactericidal activities increased from 128-fold to 256-fold. The combination effect was confirmed by time-kill curve assay which showed that 6.25 μ g/ml δ -cadinene combined with 400 μ g/ml (subinhibitory concn.) indole was bactericidal against *S. mutans*. The combination of 25 μ g/ml δ -cadinene and 400 μ g/ml indole reduced the number of viable cells at any stage of growth. AA

FATS AND OILS

1597

Wei-Tsai (S), and Sheng-Chang (C). **Kinetics of lipase-catalyzed hydrolysis of lipids in biphasic organic-aqueous systems.** *Journal of Chemical Technology and Biotechnology* 57(2); 1993; 147-154

A kinetic model is presented for lipase hydrolytic reactions in biphasic systems, with or without the addition of water-immiscible organic solvents. The effects of certain parameters, e.g. enzyme concn., mixing speed, vol. fraction of the aqueous phase and substrate concn., on the reaction rate are demonstrated. BV

1598

Kennedy (MJ), Reader (SL) and Davies (RJ). **Fatty acid production characteristics of fungi with particular emphasis on γ -linolenic acid production.** *Biotechnology and Bioengineering* 42(5); 1993; 625-634

Fatty acid production characteristics of fungi were investigated. A characteristic relationship between the oil content of the cell and the fatty acid content of the oil was observed. For example, for polyunsaturated fatty acid production by *Mucor hiemalis* IPD 51, the oil content of the cell and the γ -linolenic acid (GLA) content of the oil were coupled. A model of max. fatty acid production was developed to link fatty acid content of oil and the oil content of cells. Max. volumetric productivity of GLA occurred at a specific GLA content of the oil. For example, for *M. hiemalis* IPD 51, a max. volumetric productivity of 4.7 mg GLA/l/h was produced at a GLA content of the oil of 8-10%. Similarly for *Mucor circinelloides* var. Tieghem IPD 155 a max. volumetric productivity of 4.8 mg GLA/l/h was produced at a GLA content of the oil of 14-16%. Results indicate that, when screening microorganisms for GLA or other fatty acid production, a number of medium compositions need to be evaluated to determine the relationship between oil content of the cell and fatty acid content of the oil. AA

Oils

1599

Halvorsen (JD), Mammel (WCJr) and Clements (LD). **Density estimation for fatty acids and vegetable oils based on their fatty acid composition.** *Journal of the American Oil Chemists' Society* 70(9); 1993; 875-880

The liquid density (LC) of fatty acids can be accurately estimated by the modified Rackett equation (MRE) over a wide range of temp. The MER requires the critical properties and an empirical parameter, Z_{RA} , for each acid as the basis for computing density as a function of temp. The LD of vegetable oils can be estimated by using mixture properties corresponding to the fatty acid composition and a correction for triglyceride form. The density prediction is explicitly temp. dependent. AA

1600

Kurashige (J), Matsuzaki (N) and Takahashi (H). **Enzymatic modification of canola/palm oil mixtures: effects on the fluidity of the mixture.** *Journal of the American Oil Chemists' Society* 70(9); 1993; 849-852

The bioreactor system to interesterify edible oils and fats at an ultra-micro aqueous phase of 100 p.p.m. and less was investigated. The adsorption of lecithin, together with lipase onto a carrier, was effective for conducting the interesterifying reaction efficiently for oils and fats in micro aqueous phase. To improve the handling properties of palm oil at rather low temp., palm oil was blended with canola (rapeseed) or soybean oil, and then these blended oils were modified by enzymic selective interesterification in a solvent-free, ultra-micro aqueous bioreactor system with an immobilized lipase that had 1,3-positional specificity. Effects of enzymic interesterification were confirmed by triglyceride detn., by solid fat content profiles and by cloud point profiles, which were also compared to products of chemical interesterification. The improvement in the fluidity of blended oils with canola oil by the enzymic reaction was greater than with soybean oil; and chemical interesterification had no effects on the fluidity of blended oils. BV

1601

Poncelet (D), Leung (R), Centomo (L) and Neufeld (RJ). **Microencapsulation of silicone oils within polyamide-polyethylenimine membranes as oxygen carriers for bioreactor oxygenation.** *Journal of Chemical Technology and Biotechnology* 57(3); 1993; 253-263

1602

Best (D). **The dope on frying oil quality.** *Prepared Foods* 162(3); 1993; 63-64

Techniques for extending the life of frying oils are described. Aspects covered include: costs savings; product quality; degradation of frying oils; controlling degradation reactions; health implications of frying oils (acrolein, a volatile degradation product of the glycerol portion of fats); proper maintenance of frying oils; use of passive filters (e.g. diatomaceous earth); use of active filters; and use of antioxidants. BV

Groundnut oils

1603

Chiou (RYY), Cheng (SL), Tseng (CY) and Lin (TC). **Flavor fortification and**

characterization of raw peanut oils subjected to roasting with partially defatted peanut meal under various atmospheric conditions. *Journal of Agricultural and Food Chemistry* 41(7); 1993; 1110-1113

Raw peanut oil was combined with partially defatted peanut meal at a ratio of 10:1 (w/w) and roasted at 160°C for 30 min in a closed chamber under [air, vacuum, CO₂, N₂ or He, or in an open container]. Addition of 10-20% moisture to peanut meal was essential for the formation of peanutty flavour in oil. A unique and pleasant roasted peanut flavour was achieved when roasting was carried out under atmospheres of CO₂ and He. The free fatty acid content increased in the oil when the atmosphere during roasting consisted of O₂, while slight decreases were observed in oils prepared using other atmospheric gas systems. After storage at 62°C for 35 days, free fatty acid and conjugated diene hydroperoxide contents increased in oils subjected to all treatments. However, the fatty acid composition in oils varied only within a limited range. Significant antioxidative activities were observed in peanut oils roasted with partially defatted peanut meal under CO₂, He and N₂. AA

Linseed oils

1604

Bhatty (RS). **Further compositional analyses of flax: mucilage, trypsin inhibitors and hydrocyanic acid.** *Journal of the American Oil Chemists' Society* 70(9); 1993; 899-904

Registered Canadian cv. of flax [linseed; *Linum usitatissimum* L.] and laboratory-prepared and commercially obtained samples of linseed meal (LM), were used to determine extract viscosity and mucilage, trypsin inhibitors and hydrocyanic acid (HCN) concn. The mucilage readily leached out from the seed coat (hull) fragments soaked in water, leaving behind pentagon-shaped cells. Extract viscosity significantly varied in the laboratory-prepared (23-48 cS) and commercially obtained (30-68 cS) samples of LM and may be used to obtain an indirect, qualitative estimate of flax mucilage. Mucilage was extracted from whole seed in 5.0-5.3% yields and contained 20-24% protein, approx. 10% ash and 30% total carbohydrates. Laboratory-prepared LM (raw)

contained 42-51 units of trypsin inhibitor activity, commercially obtained samples, 14-37 units, and raw rapeseed and soybean meals, 99 and 1650 units, respectively. Picric acid tests (qualitative) showed only traces of HCN in 10 cv. of freshly ground flax. The acid silver nitrate titration procedure measured HCN quantitatively, but showed its presence only in 3 of the 5 cv. investigated. HCN was conveniently measured by a colorimetric procedure (barbituric acid-pyridine reaction), which may be used to screen flax cv. HCN content of flax was significantly influenced by environments (growth location and season) and, to a less extent, by cv. AA

Olive oils

1605

Frega (N), Bocci (F) and Lercker (G). **High-resolution gas chromatographic determination of alkanols in oils extracted from olives.** *Journal of the American Oil Chemists' Society* 70(9); 1993; 919-921

1606

Pradas (GE), Sanchez (VM) and Campo (GA). **Influence of the physical-chemistry properties of an acid activated bentonite in the bleaching of olive oil.** *Journal of Chemical Technology and Biotechnology* 57(3); 1993; 213-216

Natural bentonite and H₂SO₄ (0.5-5.0M) treated bentonite were used at 90°C in the bleaching of olive oil from Jaen, Spain. Bleaching capacities were calculated using the Freundlich equation. Bleaching capacities, measured as KF, a constant related to bleaching efficiency, ranged from 2.5×10^{-7} for non-treated bentonite up to 0.81 for 5.0M H₂SO₄-treated bentonite and 0.85 for 2.5M H₂SO₄-treated bentonite. BV

1607

Sayadi (S) and Ellouz (R). **Screening of white rot fungi for the treatment of olive mill waste-waters.** *Journal of Chemical Technology and Biotechnology* 57(2); 1993; 141-146

Rapeseed oils

1608

Mailer (RJ), Daun (J) and Scarth (R). **Cultivar identification in *Brassica napus* L. by reversed-phase high-performance liquid chromatography of ethanol extracts.** *Journal of the American Oil Chemists' Society* 70(9); 1993; 863-866

A method was developed to identify cv. of rapeseed (*Brassica napus* L.), an outcrossing sp., by reversed-phase HPLC based on the separation of ethanol-extractable seed components. Defatted flour was extracted into 70% ethanol in water, and chromatography was carried out in a reversed-phase C18 column. Optimum results were achieved using water as mobile phase with a gradient to 50% acetonitrile and peak detection at 210 nm and 240 nm. Trifluoroacetic acid (0.1%) was added to dissociate proteins. Extraction and chromatographic conditions were reproducible, and significant differences were found in the chromatograms of the 29 cv. studied. Chromatographic differences between these cv. were stable over a range of growing environments. It was possible to allocate unknown cv. to their correct classes using the HPLC method together with discriminate analysis. This test has potential as a method of characterization for cv. registration. BV

1609

Tautorius (CL) and Low (NH). **Chemical aspects of chlorophyll breakdown products and their relevance to canola oil stability.** *Journal of the American Oil Chemists' Society* 70(9); 1993; 843-847

Production of prooxidant compounds by subjecting chlorophyll a or pheophytin a to laboratory-scale processing in the presence of canola [rapeseed] oil (CO) or tricapryloylglycerol (TCG) was investigated. Addition of chlorophyll a (60 p.p.m.) to CO prior to processing resulted in an oil of lowered stability. No single processing step contributed solely to the instability resulting when pheophytin a was added (60 p.p.m.) to CO prior to processing. To isolate the effect of processing on the pigment, TCG was used in place of unsaturated CO as a carrier for pheophytin a (60 p.p.m.). A control consisted of processed TCG that had no pheophytin added prior to processing. The subsequent addition of

pigment-treated processed TCG to linseed oil (1:1, w/w) caused a decrease in the stability of the latter, when compared with the control. No differences were observed between the prooxidant TCG and the control TCG by methods involving UV spectroscopy and TLC or GC. BV

1610

Suzuki (K) and Nishioka (A). **Behavior of chlorophyll derivatives in canola oil processing.** *Journal of the American Oil Chemists' Society* 70(9); 1993; 837-841

Chlorophyll derivatives in canola [rapeseed] oil (CO) were analysed quantitatively by reversed-phase HPLC without any pretreatment. The main components were pheophytin (phea) a and b and pyropheophytin (pyro) a and b. Factors affecting types and concn. of chlorophyll derivatives in oil were investigated during seed preparation, expelling, extraction, degumming and alkali-refining processes. Bleaching tests of alkali-refined CO with activated earth indicated that the adsorption of each derivative decreased in the following order: pheo a > pyro a > pheo b > pyro b. In bleaching with activated C, the following order was observed: pyro b > pheo b > pheo a > pyro a. AA

1611

Henderson (JH). **A laboratory study of the press effect in adsorptive bleaching.** *Journal of the American Oil Chemists' Society* 70(9); 1993; 831-835

The so-called press effect is widely credited with enhancing the overall efficiency of bleaching clays (BC) in commercial operations. Laboratory bleaches are generally carried out with one use of BC, while plant operations often include a process in which spent clay in a filter press acts as a fixed bed to remove additional impurities from slurry-treated oil. The press effect was simulated in the laboratory by measuring the influence of a progressively-built filter cake on concn. of carotenes and chlorophyll in successive batches of slurry-contacted oils. The oil used was canola (rapeseed); the clay tested was a commercially available acid-activated clay classified to 2 different average particle sizes.

Conditions were chosen to simulate those used in commercial operations. Better total bleaching was observed from the 1st batch to the last as filter cake was built up. A significant particle size effect was observed. AA

1612

Sosulski (K) and Sosulski (FW). **Enzyme-aided vs. two-stage processing of canola: technology, product quality and cost evaluation.** *Journal of the American Oil Chemists' Society* 70(9); 1993; 825-829

Use of carbohydrases (SP-249 and Olease 0.1 and 0.01% respectively) to enhance oil extraction during pressing [of rapeseed] in a lab. expeller was investigated. Enzyme-treated seeds at 6% moisture were pressed in the expeller set at full-press conditions. Control seeds were pressed at wider choke openings but at the same barrel pressures as enzyme-treated samples. Time of pressing and temp. and pressure inside the expeller barrel were used to calculate throughput and energy requirements/unit wt. of processed material. Treatment with enzymes improved throughput of the expeller, increased oil flow rate and oil recovery. Material throughput was increased by 30-50%, depending on canola var. Recovery of the oil was increased from 72% of the seed oil for control samples, to 90-93% for enzyme-treated samples. The average residual oil content in presscakes from enzyme-treated seeds was 7.4%. Oil quality was inferior to cold-pressed control but was much better than has been reported for solvent-extracted oil. BV

Rice bran oils

1613

Gopala Krishna (AG). **Influence of viscosity on wax settling and refining loss in rice bran oil.** *Journal of the American Oil Chemists' Society* 70(9); 1993; 895-898

The role of viscosity on wax settling and refining loss (RL) in rice bran oil (RBO) was studied using model systems of refined peanut oil and RBO of different free fatty acids contents. Wax was the only constituent of RBO that significantly increased the viscosity (81.5%) of oil. Monoglycerides (MG) synergistically raised the viscosity of the oil (by 114.2%) and lowered

the rate of wax settling. Although a reduction in the viscosity of the oil significantly decreased the refining loss, the min. loss attained was still 20% more than the theoretically predicted value. This study indicates that some chemical constituents, such as MG must be removed before dewaxing; and that removal of oryzanol and phospholipids would reduce RL. BV

1614

Munshi (SK), Bhatia (N), Sekhon (BS) and Sukhija (PS). **Inactivation of rice bran lipase with metal ions.** *Journal of Chemical Technology and Biotechnology* 57(2); 1993; 169-174

Rice bran lipase was purified and characterized and the effects of metal ions as inhibitors of lipase activity were investigated. Lipase was extracted from rice bran and purified 333-fold by ammonium sulphate fractionation and chromatography. Lipase activity was completely inhibited by Fe^{3+} and Ni^{2+} at $5 \times 10^{-5}\text{M}$ and by Zn^{2+} and Cu^{2+} at $2.5 \times 10^{-4}\text{M}$. Results from in vivo inactivation of rice bran lipase showed that Fe^{3+} and Ni^{2+} at 200 $\mu\text{g/g}$ significantly inhibited the release of free fatty acids from rice bran during 6 days storage when compared to a control (2% v/w HCl) treatment. It is suggested that Fe^{3+} and Ni^{2+} could be used commercially to inhibit lipase hydrolysis of rice bran triglycerides and thus contribute to the improved quality of edible rice bran oils. BV

Soybean oils

1615

O'Keefe (SF), Wiley (VA) and Wright (D). **Effect of temperature on linolenic acid loss and 18:3 δ^9 -cis, δ^{12} -cis, δ^{15} -trans formation in soybean oil.** *Journal of the American Oil Chemists' Society* 70(9); 1993; 915-917

Oil was extracted from soybeans, degummed; alkali-refined and bleached. The oil was heated at 160, 180, 200, 220 and 240°C for up to 156 h. Fatty acid methyl esters were prepared by boron triglyceride - catalysed trans esterification. GLC with a cyanopropyl CPSil88 column was used to separate and quantitate fatty acid methyl esters. Fatty acids were identified by comparison of retention times

with standards and were calculated as area % and mg/g oil based on 17:0 internal standard. The rates of 18:3 ω 3 loss and 18:3 δ^9 -cis, δ^{12} -cis, δ^{15} -trans (18:3,c,c,t) formation were determined, and the activation energies were calculated from Arrhenius plots. Freshly prepared soybean oil had 10.1% 18:3 ω 3 and no detectable 18:3c,c,t. Loss of 18:3 ω 3 followed apparent 1st-order kinetics. The first-order rate constants ranged from 0.0018 plus/minus 0.00014 min^{-1} at 160°C to 0.083 plus/minus 0.0033 min^{-1} at 240°C. Formation of 18:3c,c,t did not follow simple kinetics, and initial rates were estimated. The initial rates (mg/g oil/h) of 18:3c,c,t formation ranged from 0.0031 plus/minus 0.0006 at 160°C to 2.4 plus/minus 0.24 at 240°C. The Arrhenius activation energy for 18:3 ω 3 loss was 82.1 plus/minus 7.2 kJ mol^{-1} . The apparent Arrhenius activation energy for 18:3c,c,t formation was 146.0 plus/minus 13.0 kJ mol^{-1} . Results indicate that small differences in heating temp. can have a profound effect on 18:3c,c,t formation. Selection of appropriate deodorization conditions could limit the amount of 18:3c,c,t produced. AA

1616

Smith (DD), Agrawal (YC), Sarkar (BC) and Singh (BPN). **Enzymatic hydrolysis pretreatment for mechanical expelling of soybeans.** *Journal of the American Oil Chemists' Society* 70(9); 1993; 885-890

Mechanical expelling of soybeans with enzymic hydrolysis as pretreatment was investigated and the process parameters were optimized by means of response surface methodology. Enzyme pretreatment enhanced both the amount of extractable oil in soybeans and oil extractability. A second-order response surface model was developed to predict the expelled oil as a function of the 6 process parameters investigated. The optimum was found at: moisture content during hydrolysis, 23.00% wet basis (w.b.); enzyme concn., 11.84% v/w; incubation period, 13.24 h; moisture content during pressing, 9.36% w.b.; pressing pressure, 75 MPa; and pressing time, 5.36 min. The parameters had no interactive effects on expelled oil. Pressing pressures greater than 75 MPa caused extrusion. Under the optimal conditions, oil expelled from dehulled cracked soybeans by static pressing at room temp.

(18°C) was 63.5% of the total extractable oil. Much higher oil recovery would be expected in actual screw expellers due to dynamic pressing and higher operating temp. Oil recovery could be further increased by adding greater than or equal to 1 conventional pretreatments to the enzymic hydrolysis pretreatment investigated in this study. AA

SPICES AND CONDIMENTS

Condiments

1617

Davis (S). **New condiments offer the spice of life.** *Prepared Foods* 162(5); 1993; 73-74

Development of new condiment products in the US in 1992 is discussed. The number of new products introduced decreased by 8% in 1992. Aspects discussed include; sauces, many garlic-enhanced; Mexican seasonings and mixes; salsa/ketchup combinations; cooking sauces (barbecue, spaghetti, Italian, Caribbean); salad dressings, mustard and oils; and jellies and preserves. BV

Spices

Chillies

1618

Bernal (MA), Calderon (AA), Pedreno (MA), Munoz (R), Ros (B-A), Merino (deC-F). **Capsaicin oxidation by peroxidase from *Capsicum annuum* (var. *annuum*) fruits.** *Journal of Agricultural and Food Chemistry* 41(7); 1993; 1041-1044

Capsaicin (8-methyl-N-vanillyl-6-nonenamide) oxidation by peroxidase (EC 1.11.1.7) from *Capsicum annuum* var. *annuum* fruits was studied. Capsaicin contained 2 components which were oxidized indistinctively by capsicum peroxidase (CP), when capsaicin disappearance was monitored by HPLC. Capsaicin oxidation by CP caused max. spectral changes at 262 nm. The apparent extinction coeff. for the only oxidation product absorbing at 262 nm was calculated as $5.3 \times 10^2 \text{ M}^{-1} \text{ cm}^{-1}$. Dependence of capsaicin

oxidation rate by CP on capsaicin and H_2O_2 concn. revealed Michaelis-Menten-type kinetics with inhibition at high substrate concn. and an acidic pH optimum. Results indicate that capsaicin is oxidized by CP and that a possible participation of peroxidase in capsaicin metabolism in capsicums should be considered. BV

SENSORY EVALUATION

1619

Bourne (MC). **Converting from empirical to rheological tests on foods - its a matter of time.** *Cereal Foods World* 39(1); 1994; 37-39

The author discusses a dilemma in rheological studies of foods - fundamental tests are poor predictors of sensory quality whereas empirical tests are good predictors but not rigorously defined. CSA

1620

Xiaogen (Y), Lederer (C), McDaniel (M) and Deinzer (M). **Chemical analysis and sensory evaluation of hydrolysis products of humulene epoxides II and III.** *Journal of Agricultural and Food Chemistry* 41(8); 1993; 1300-1304

A method was developed to identify hydrolysis and isomerization products of humulene epoxides II and III in beer. The method involved a continuous liquid-liquid extraction, cleanup and concn. procedure and analysis by GC/MS. 12 compounds were identified in the concn. range 0.002-2.8 mg/l in pilot brew and commercial beer samples. 7 of these compounds have not been found in beer before. A var. of hop essential oils, obtained by steam distillation, also was analysed by GC/MS. In addition to humulene monoepoxides I-III, humulenol II and 2,6,6,9-tetramethyl-2,4,8-cycloundecatrieno-1-ol (TMCD) were found in hop oils. TMCD has not been reported as a hop oil component previously. Sensory profiles of individual compounds and their mixtures produced by hydrolysis of humulene epoxides II and III were evaluated by a descriptive sensory panel. Overall, these compounds could be described as contributing cedar, lime and spicy aromas

to the beer. The estimated threshold value for the hydrolysis mixture of humulene epoxide II in beer was 2.3 p.p.m. AA

FOOD STORAGE

Nil

INFESTATION CONTROL AND PESTICIDES

Nil

BIOCHEMISTRY AND NUTRITION

1621

Sam (P-L), Yunje (C) and Batt (CA). **Enhancing the gelation of β -lactoglobulin.** *Journal of Agricultural and Food Chemistry* 41(8); 1993; 1343-1348

1622

Danno (G), Kanazawa (K), Toda (M), Mizuno (M), Ashida (H), Nataka (M). **A mutagen from histidine reacted with nitrite.** *Journal of Agricultural and Food Chemistry* 41(7); 1993; 1090-1093

Mutagenicity of the reaction products of L-histidine with sodium nitrite at pH 4.0 were studied. 1 of the 5 reaction products obtained showed mutagenicity in *Salmonella typhimurium* his reversion assay. The mutagen was purified by crystallization and identified as (1-nitroso-1H-imidazol-4-yl)acetohydroxamic acid (NIAH), which results from histidine undergoing nitrosation at the imidazolic secondary amine and oxidation of the primary amine at the side chain. NIAH showed a lethal mutation on TA98 strain without S9 mix and then was submitted to the induced mutation frequency (IMF) test. NIAH gave a dose-dependent IMF value on TA98: the value at 10 mug/plate was 4.29×10^{-6} /cell. NIAH exhibited weak mutagenicity on TA100 strain and did not have a DNA-damaging activity on H17 Rec⁺ and M45 Rec⁻ of *Bacillus subtilis*. Therefore, NIAH was considered to be a frame-shift-type mutagen. AA

1623

Oh (S), Catignani (GL) and Swaisgood (HE). **Characteristics of an immobilized form of transglutaminase: a possible increase in substrate specificity by selective interaction with a protein spacer.** *Journal of Agricultural and Food Chemistry* 41(8); 1993; 1337-1342

Transglutaminase was covalently immobilized on poly(lysyl)- α -casein which was covalently attached to 3-aminopropyl porous glass. Attachment of polylysine to the protein spacer, using soluble transglutaminase as a catalyst, greatly increased the concn. of immobilization sites, resulting in a 74% yield of immobilized protein. Catalytic efficiencies, k_{cat}/K_m , for the immobilized form were 12-13% of that for the soluble enzyme with either α_s -casein or β -lactoglobulin as substrate. The catalytic efficiency was 5-fold greater with α_s -casein than with β -lactoglobulin using either soluble or immobilized enzyme. Selective interaction of the protein substrate with the protein spacer resulted in selective catalysis of isopeptide bond formation in α_s -casein due to increased local concn. of this protein in the immobilized enzyme matrix. When a mixture of α_s -casein and β -lactoglobulin was used as substrate, preferential cross-linking of α_s -casein occurred with the immobilized enzyme as compared with the soluble enzyme. AA

1624

Potter (SM), Jimenez (F-R), Pollack (J), Lone (TA) and Berber (J-MD). **Protein-saponin interaction and its influence on blood lipids.** *Journal of Agricultural and Food Chemistry* 41(8); 1993; 1287-1291

Protein source and saponins have been shown to influence lipid metabolism; however, little is known about the chemical interactions between proteins and saponins or the impact of addition of dietary saponins to different proteins on cholesterolaemia. Quillaja saponin was added to casein and to soy protein isolates (SPI) and the saponin-protein interaction was investigated by gel electrophoresis and fluoroscopy. The impact on cholesterol metabolism also was investigated in gerbils. Results from interaction studies showed that

high mol. wt. complexes were formed gradually between saponins and caseins, with beta-casein being most susceptible. The resulting complexes differed drastically in charge and mol. wt. In contrast, SPI formed insoluble aggregates during heating independently of the presence of added quillaja saponin. Data from the animal study showed that addition of saponin to SPI did not affect serum lipids, while addition of saponin to casein resulted in significant decreases of LDL cholesterol and LDL/HDL ratios, resulting in values similar to those of SPI-fed animals. Results indicate that the effect of saponins on serum lipid profiles is dependent on the source of dietary protein. This could be explained by the finding that quillaja saponin reacted differently with caseins as compared to soy protein isolate. AA

1625

Osada (K), Kodama (T), Yamada (K) and Sugano (M). **Oxidation of cholesterol by heating.** *Journal of Agricultural and Food Chemistry* 41(8); 1993; 1198-1202

Oxidation of pure cholesterol during heating in an air oven at high temp. [100°C] was studied. Cholesterol was virtually stable during heating at 100°C for 24 h but was unstable at > 120°C. In the heated cholesterol preparations, a number of oxidized derivatives were detected by a combination of TLC and capillary GC-MS. Major oxidized sterols were 7 α -hydroxycholesterol, 7 β -hydroxycholesterol, 5 α -epoxycholesterol, 5 β -epoxycholesterol, cholestanetriol and 7-ketocholesterol. Various oxidized cholesterol derivatives were produced during heating above 120°C within a relatively short time (1 h). The composition of oxidized products differed depending on temp. and time of heating. When cholesterol was heated at 150°C, production of oxidized cholesterol was max., 7-ketocholesterol being the predominant oxidized product. Heating at 120°C also produced oxidized cholesterol to some extent, whereas only marginal amounts of oxidized cholesterols were produced at 100°C; at 200°C cholesterol was decomposed within 6 h. AA

1626

Matsudomi (N), Oshita (T), Kobayashi (K) and Kinsella (JE). **α -Lactalbumin enhances the gelation properties of bovine serum**

albumin. *Journal of Agricultural and Food Chemistry* 41(7); 1993; 1053-1057

Effects of α -lactalbumin (α -La) addition to bovine serum albumin (BSA) on its gelling properties were investigated. A BSA concn. of 4% (w/v) was required for formation of a self-supporting gel following heating at 80°C for 30 min in 100mM sodium phosphate buffer (pH 6.8). Sol. of α -La, at concn. of 8% (w/v), did not gel under the same conditions. Addition of 3% α -La to 6% BSA caused a significant increase in gel hardness; gels thus obtained were transparent. BSA and α -La interacted to form soluble aggregates through thiol-disulphide interchange reaction during gel formation. The soluble aggregates formed during heating of the mixture of BSA and α -La had lower mol. wt. than those formed from BSA alone. The enhancing effect of α -La on gel hardness of BSA was ascribed to the formation of a finer, more uniform gel matrix. AA

1627

Ching (YM), Paquet (A) and McKellar (RC). **Effect of fatty N-acylamino acids on some functional properties of two food proteins.** *Journal of Agricultural and Food Chemistry* 41(8); 1993; 1182-1186

Effects of fatty N-acylamino acids on foaming, emulsifying and gelling properties of (spray-dried) egg white and whey protein isolates were investigated. Overrun, emulsifying activity and gelling properties of the 2 protein products were generally enhanced by addition of 0.1-0.5% of the fatty N-acylamino acids, while foaming stability was lowered. Both lauroyl (C12) and myristoyl (C14) derivatives were highly effective, particularly derivatives of phenylalanine and methionine. The palmitoyl (C16) and stearoyl (C16) derivatives were less effective, while esters of active derivatives did not affect protein functionality. Thermal characteristics of the proteins were modified by fatty N-acylamino acids and were related to changes in functional properties. Results suggest that fatty N-acylamino acids may be of use as multifunctional food additives. AA

1628

Ferjancic (B-A), Gaertner (H) and Puigserver (A). **Papain-catalyzed hydrolysis of and amino acid incorporation into BSA and zein substrates in low water organic media.** *Journal of Agricultural and Food Chemistry* 41(7); 1993; 1152-1157

Papain, either modified with polyethylene glycol (PEG) or as a suspended powder, was used to catalyse digestion of protein substrates in organic solvents to gain insights into protein-protein interactions in media of this kind. Bovine serum albumin was efficiently hydrolysed in toluene containing 1-2% added water (v/v). The extent of proteolysis, as estimated by amino group determination, depended on the water concn. and, under optimal conditions, was 20% higher than that obtained in aqueous media using the same enzyme/substrate ratio. The highest rate of hydrolysis was obtained in the most hydrophobic solvent, but attachment of PEG chains to the enzyme did not enhance the catalysis. Proteolysis in organic solvents can be said to constitute an interesting approach to the enzymic digestion of proteins and amino

acid incorporation involved in aminolysis. In the case of the hydrophobic protein zein, greater than 10% of the peptide bonds were hydrolysed by PEG-papain in toluene, and in the presence of a potent nucleophile such as Lys-OMe or Lys-NH₂ the transpeptidation reaction resulted in an increase in the lysine content of zein from 0.15% to 3.5% and 10.4%, respectively. Use of organic media, therefore, provides a potentially useful approach to the enzymic modification of food protein. AA

TOXICOLOGY

Nil

FOOD LAWS AND REGULATIONS

1629

Sohrab. **ISO 9000: A pre-requisite for product certification.** *Indian Food Industry* 12(3); 1993; 38-40

AUTHOR INDEX

- Abdul-Karim (MNB)
1532
- Abdulla (A-HH)
1567
- Abouzied (MM)
1573
- Abu Bakar (F)
1532
- Agrawal (YC)
1616
- Agu (RC)
1496
- Aho (MA)
1560
- Al-Jassim (AF)
1567
- Anita Rawat
1542
- Anjaneyulu (ASR)
1575
- Ansari (AA)
1497
- Arino (A)
1568
- Arup Dutta
1440
- Arvind Kumar
1507
- Arya (SS)
1500
- Ashida (H)
1622
- Bader (J)
1512
- Bajaj (VK)
1591
- Bakker (R)
1455
- Banerjee (AK)
1515
- Barker (PE)
1536
- Batt (CA)
1621
- Bawa (AS)
1513
- Benthin (S)
1462
- Berber (J-MD)
1624
- Bergeron (EA)
1564
- Bernal (MA)
1618
- Best (D)
1460 1482 1487 1602
- Bhatia (N)
1614
- Bhatty (RS)
1604
- Bindal (MP)
1549
- Black (R)
1499
- Bocci (F)
1605
- Borja (R)
1590
- Bourne (MC)
1619
- Bradley (JA)
1563
- Britten (M)
1555
- Bron (S)
1464
- Burger (M-K)
1501
- Burmeister (DM)
1525
- Butuzova (L)
1521
- Calderon (AA)
1618
- Campo (GA)
1606
- Carbonaro (M)
1502
- Carnovale (E)
1502
- Casolari (C)
1467
- Castle (L)
1474
- Catignani (GL)
1623
- Centomo (L)
1601
- Chandra (A)
1529
- Chaudhuri (JB)
1449
- Chen (BH)
1514
- Chen (YY)
1514
- Cheng (H-W)
1573
- Cheng (SL)
1603
- Chin (PM)
1495
- Ching (YM)
1627
- Chinnaswamy (R)
1488
- Chiou (RYY)
1603
- Chopra (SK)
1523
- Chuaqui (O-N)
1576
- Clements (LD)
1599
- Coffey (A)
1461
- Cook (LV)
1564
- Crown (JK)
1519
- Cunningham (FE)
1580
- D'Aoust (JY)
1572
- Dalal (MA)
1518
- Daly (C)
1461
- Danno (G)
1622
- Daun (J)
1608
- Davies (RJ)
1598
- Davis (S)
1429 1491 1522 1533 1540
1541 1543 1589 1617
- De (TK)
1498
- Decker (SJ)
1435
- Degelau (A)
1481
- Deinzer (M)
1620
- Dewanji (A)
1517
- Dikshit (M)
1506
- Dilley (DR)
1525
- Diosady (LL)
1569
- Dornblaser (L)
1430 1539 1547 1550
1571 1586 1587

Dorsa (WJ)	Geetha (D)	Henderson (JH)
1585	1473	1611
Drake (SR)	Gergova (K)	Herrera (A)
1524	1521	1568
Dreesen (DW)	Ghatge (UM)	Hertog (MGL)
1564	1503	1588
Duque (C)	Ghazali (HM)	Hingorani (NA)
1516	1528	1445
Duran (MM)	Giovanetti (E)	Hirn (JA)
1590	1467	1560
Eads (TM)	Giroux (HJ)	Hogue (AT)
1520 1527	1553	1564
Eerola (SH)	Glynn (AB)	Hollman (PCH)
1560	1441	1588
El-Samragy (YA)	Goma (G)	Hoogendijk (JM)
1552	1478	1501
Elkin (RG)	Gopala Krishna (AG)	Hotta (K)
1579	1613	1583
Ellouz (R)	Goswami (SN)	Hung (TV)
1607	1509	1499
Endo (H)	Gowramma (RV)	Ibrahim (HR)
1470	1519 1594	1453
Erickson (JP)	Grau (FH)	Iezzoni (AF)
1479	1565	1529
Estela (LA)	Greebe (RP)	Inamori (Y)
1466	1559	1470
Fabio (U)	Green (SS)	Ingle (UM)
1467	1564	1503
Facinelli (B)	Guerra (H-E)	Ingledeu (WM)
1467	1490	1495
Ferjancic (B-A)	Guerrero (AM)	Isaeva (L)
1628	1576	1521
Fitzgerald (G)	Gunjal (BB)	Islam (MS)
1461	1503	1469
Foda (MI)	Gupta (RP)	Jadhav (HD)
1552	1480	1537
Forcinio (H)	Hackney (CR)	James (WO)
1437 1551	1585	1564
Freed (MB)	Hahnau (S)	Jana (AH)
1579	1448	1535 1544
Frega (N)	Halvorsen (JD)	Jandal (JM)
1605	1599	1553
Friedman (M)	Hanlin (MB)	Jayaraman (KS)
1428 1431 1432 1547	1454	1434 1526
Furneaux (RH)	Hanna (MA)	Jericho (KWF)
1451	1488	1563
Gaertner (H)	Hartman (PA)	Jimenez (F-R)
1628	1570	1624
Gandhi (DN)	Hasabnis (AB)	Jinap (S)
1554	1537	1446
Gannon (VPJ)	Hasan (MK)	Jorapur (RM)
1563	1469	1498
Garcia (C-F)	Hashim (DM)	Joseph (A)
1510 1511	1528	1506
Garcia (V-B)	Hayakawa (J)	Joshi (AS)
1490	1447	1546
Gast (RK)	Helser (JPG)	Kalchayanand (N)
1581	1501	1454

Kanazawa (K)	Kwong (SCW)	Majjala (RL)
1622	1459	1560
Kantt (CA)	Lakshminanan (V)	Mailer (RJ)
1584	1575	1608
Karim (MN)	Lasko (DR)	Mammel (WCJr)
1476	1485	1599
Kathiresan (G)	Laveda (F)	Marshall (DL)
1538	1510 1511	1585
Kato (A)	Lederer (C)	Martin (A)
1453	1620	1590
Kaur (R)	Lee (KH)	Martin (DR)
1480	1450 1468 1472	1564
Kennedy (MJ)	Lee (MB)	Martinez (G-E)
1598	1578	1490
Khan (SI)	Lee (PM)	Martino (A)
1469	1450 1468 1472	1452
Khanna (K)	Lee (SJ)	Mathur (S)
1486	1481	1440
Khorshid (MA)	Lee (W-O)	Matsudomi (N)
1552	1557	1626
Khurdiya (DS)	Lehrer (SB)	Matsuzaki (N)
1518 1531 1593	1433	1600
Kieft (KA)	Lercker (G)	Mawson (AJ)
1579	1605	1483
Kiewiet (R)	Leung (R)	McCollum (TG)
1464	1601	1530
Kim (Y-H)	Li (C-E)	McDaniel (M)
1441	1556	1620
Kinsella (JE)	Likidis (Z)	McDonald (CE)
1626	1512	1493
Klaenhammer (TR)	Lin (TC)	McDonald (RE)
1463	1603	1530
Klingspohn (U)	Liu (LH)	McDougall (TE)
1512	1499	1576
Knudtson (LM)	Lone (TA)	McKellar (RC)
1570	1624	1627
Kobayashi (K)	Loos (H)	Merino (deC-F)
1453 1626	1481	1618
Kodama (T)	Lotha (RE)	Mikami (B)
1625	1531 1593	1456
Kok (J)	Lourdes (B-M)	Mikami (E)
1464	1562	1447
Kondaiah (N)	Low (NH)	Ming (TC)
1575	1609	1528
Kozub (GC)	Lumen (BOde)	Minkova (V)
1563	1489	1521
Kracke (HHA)	Luque (M)	Minoura (K)
1512	1590	1470
Kruse (B)	Madhukara (K)	Mital (BK)
1512	1484	1542
Kubo (A)	Mahadeviah (M)	Mittal (SK)
1504	1519 1594	1507
Kubo (I)	Mahajan (BVC)	Miyamoto (K)
1504 1596	1523	1470
Kumar (KR)	Maharaj (V)	Mizuno (M)
1594	1436	1622
Kurashige (J)	Mahendrapandian (S)	Montilla (J)
1600	1594	1490

Moody (MW)
1585
Morales (A)
1516
Moriwaki (K)
1468
Moriwaki (M)
1470
Munoz (R)
1618
Munshi (SK)
1614
Muroi (H)
1504 1596
Murphy (VG)
1476
Nagai (M)
1456
Nair (MS)
1529
Nakagawa (S)
1583
Nakai (S)
1556
Nand (K)
1484
Nandini Nimbkar
1498
Nanmori (T)
1456
Narasimhan Ramarathnam
1569
Narayanasamy (MR)
1538
Natake (M)
1622
Neelam (V)
1480
Nelson (JT)
1441
Neufeld (RJ)
1601
Newton (RS)
1579
Nielsen (J)
1462
Nirankar Nath
1508
Nishioka (A)
1610
Noda (N)
1447
Nonaka (M)
1556
Nordby (HE)
1530
Norel (Avan)
1501

Nortje (GL)
1559
Nwifo (SC)
1496
O'Donnell (CD)
1444 1465
O'Keefe (SF)
1615
O'Neil (CE)
1433
Ockerman (HW)
1566
Odegard (WJ)
1489
Oh (S)
1623
Okeke (BC)
1496
Onwumelu (AH)
1496
Osada (K)
1625
Oshita (T)
1626
Padda (GS)
1558
Panda (B)
1575
Pandher (MS)
1480
Paquet (A)
1627
Pareilleux (A)
1478
Patel (HG)
1544
Patil (JP)
1537
Patki (PE)
1500
Pawar (VN)
1503
Pedreno (MA)
1618
Pena (JL)
1457
Pestka (JJ)
1573
Petrov (N)
1521
Pifferi (PG)
1452
Pinaga (F)
1457
Pollack (J)
1624
Poncelet (D)
1601

Potter (SM)
1624
Pradas (GE)
1606
Prajapati (JP)
1544
Prasertsan (S)
1492
Pratt (MD)
1564
Pruthi (JS)
1442
Puigserver (A)
1628
Putte (BVande)
1588
Pyle (DL)
1449
Qing (W-N)
1520
Qing (X-N)
1527
Queiroz (H-de)
1478
Radha Charan
1440
Ragland (RD)
1564
Rai (T)
1591
Rajavanshi (AK)
1498
Raju (NR)
1484
Ramana (SV)
1526
Randers (L)
1459
Rao (G)
1459
Rao (VM)
1545
Ray (B)
1454
Ray (P)
1454
Reader (SL)
1598
Rehr (B)
1481
Rivas (T)
1568
Roberts (MC)
1467
Rommel (A)
1595
Ros (B-A)
1618

Rubin (LJ)	Sedha (RK)	Smith (DD)
1569	1480	1616
Ryoo (D)	Seegers (JFML)	Smith (DM)
1476	1464	1573
Sahm (H)	Sekhon (BS)	Smith (ML)
1481	1614	1475
Sahni (CK)	Seshadri (KS)	Soares (ME)
1518	1594	1562
Sahoo (J)	Sharma (BD)	Sofos (JN)
1574	1558	1466
Saigal (D)	Sharma (HD)	Sohrab
1477	1475	1629
Sain (I)	Sharma (PK)	Sosulski (FW)
1546	1508	1612
Sam (P-L)	Shehata (AE)	Sosulski (K)
1621	1552	1612
Samoon (AH)	Sheng-Chang (C)	Spagna (G)
1574	1597	1452
Sanchez (F-A)	Sherikar (AA)	Srilatha (HR)
1510	1561	1484
Sanchez (Ferrer-A)	Sherikar (AT)	Stanley (RA)
1511	1561	1451
Sanchez (VM)	Sheshadri (KS)	Stavric (S)
1606	1519	1572
Sandhu (KS)	Shibata (K)	Stevenson (DE)
1513	1583	1451
Sankat (CK)	Shilpa (Vij)	Sud (SC)
1436	1554	1577
Sapra (RK)	Shimada (K)	Sugano (M)
1549	1583	1625
Saraswat (RK)	Shimizu (Y)	Sukhija (PS)
1515	1456	1614
Sardana (V)	Shinke (R)	Sundararajan (R)
1427	1456	1505
Sargantanis (J)	Shrivastava (AK)	Surjeet Singh
1476	1497	1515
Sarkar (BC)	Siaw (YS)	Suzuki (K)
1616	1450 1468 1472	1610
Sarmidi (MR)	Sikkema (J)	Swaisgood (HE)
1536	1455	1623
Sashi Prabhu	Sing (WD)	Swientek (B)
1515	1463	1438 1443
Satake (T)	Singh (AJ)	Tahir (MA-H)
1492	1546 1548	1567
Sayadi (S)	Singh (BPN)	Takahashi (H)
1607	1616	1600
Scarth (R)	Singh (G)	Talaat (El-Khateib)
1608	1507 1542	1566
Scheper (T)	Singh (HS)	Tamilselvan (C)
1481	1577	1505
Schnuerer (J)	Singh (RP)	Tautorus (CL)
1471	1548 1575	1609
Schoeller (C)	Singh (S)	Taylor (HW)
1449	1486 1591	1475
Schreier (P)	Singh (SA)	Teltumbade (SS)
1516	1486	1561
Schuegerl (K)	Sivaprakasam (K)	Tengerdy (RP)
1512	1473	1476

Thakar (PN)
1535
Thompson (S)
1489
Thordsen (O)
1481
Tin (CSF)
1483
Toda (M)
1622
Todd (ECD)
1582
Torres (JA)
1584
Tramper (J)
1455
Trehwella (MA)
1499
Tseng (CY)
1603
Tsujiibo (H)
1470
Ude (CM)
1496
Uribelarrea (JL)
1478
Vaidya (R)
1427
Valles (S)
1457

Vanderlinde (PB)
1565
Varaldo (PE)
1467
Vecchini (P)
1502
Veerabadran (V)
1538
Venema (G)
1464
Verheul (A)
1455
Vermue (M)
1455
Vijai Kishore (P)
1512
Villadsen (J)
1462
Vorster (SM)
1559
Wandre (SS)
1537
Wang (DIC)
1485
Waskar (VS)
1561
Wei-Tsai (S)
1597
Weiler (EW)
1448

Wiley (VA)
1615
Wintoch (H)
1516
Wright (D)
1615
Wrolstad (RE)
1595
Wu (YV)
1494
Xiaogen (Y)
1620
Yadav (PL)
1558
Yagi (T)
1583
Yamada (K)
1625
Yamada (S)
1447
Yang (TS)
1580
Yoshizaki (S)
1492
Yousef (AE)
1566
Yunje (C)
1621

SUBJECT INDEX

Acids

- cocoa beans, organic acids in 1446
- olive oils, bentonites H₂SO₄ treated & bleaching of 1606

Albumins

- bovine serum albumin, alpha, lactalbumin & gelation properties of 1626

Alcohols

- olive oils, alkanols GC determination in 1605

Aldehydes

- breakfast cereals, 5 (hydroxymethyl) 2 furaldehyde HPLC determination in 1490

Almonds

- sugar confectionery, almonds use in 1534

Amides

- capsaicin, *Capsicum annuum* peroxidases oxidation of 1618

Amines

- meat, pH & biogenic amines formation in 1560

Amino acids

- Aspergillus* aminoacylases, L phenylalanine synthesis by immobilized 1450
- Bacillus cereus* β amylases, amino acids sequence of 1456
- L histidine nitrites reaction products, mutagenicity of 1622
- egg whites, fatty N acylamino acids & functional properties of 1627

Amylases

- Escherichia coli*, *Bacillus cereus* β amylases gene expression in 1456

Anthocyanins

- cherry juices, storage & anthocyanins in 1529
- tart cherries, anthocyanins extraction from 1529
- tart cherry anthocyanin extracts, storage stability of 1529

Antibiotics

- Listeria innocua*, genetics of tetracyclines resistant 1467
- egg white lysozymes, antimicrobial compounds & stability of 1580

Antinutritional factors

- faba beans, tannins condensed &

- antinutritional factors in 1501
- linseeds, composition/antinutritional factors in 1604

Apples

- bitter pit development in apples 1525
- ethylene absorbents in packed stored apples 1523
- physico chemical characteristics of apples 1518
- storage controlled atm. & quality of apple cvs 1524

Aspartame

- Pseudomonas aeruginosa* elastases synthesis of aspartame precursors 1468

Aspergillus

- L phenylalanine synthesis by immobilized *Aspergillus* aminoacylases 1450
- properties of immobilized *Aspergillus* aminoacylases 1472

Aspergillus ochraceus

- pearl millet, *Asp. ochraceus* toxin production & susceptibility of 1497

Automation

- food industry, robotics use in 1443

Bacillus

- 1,4 β D xylan xylanohydrolases, *Bacillus polymyxa* synthesis of 1457
- Bacillus cereus* β amylases, amino acids sequence of 1456
- dough, *Bacillus subtilis* proteinases sulphites substitutes for conditioning 1458

Bacillus stearothermophilus

- meat, *B. stearothermophilus* & penicillin residues detection in 1561

Bacteria

- beef, slaughterhouses size & bacteria in 1564
- cattle carcasses, bacteria anaerobic detn. on 1563
- Corynebacterium glutamicum*, fluorescence monitoring online of 1459
- lactic acid bacteria bacteriocins, bacteria Gram negative inhibition by 1454

- meat, pH & bacteria in 1560
- organic solvents toxicity in bacteria 1455

Pseudomonas pseudoflava

- fermentation broths, *Zymomonas mobilis* glucose fructose oxidoreductases biosensors monitoring of 1481
- Streptomyces thermoviolaceus* chitinases, properties of 1470
- swine carcasses, slaughter & enterococci in 1570

Bactericides

- beef, bacteriocins & *Listeria monocytogenes* in 1566
- lactic acid bacteria bacteriocins, bacteria Gram negative inhibition by 1454

Bacteriophages

- Lactococcus lactis*, bacteriophages resistance maintenance of 1463
- Listeria* bacteriophages, typing of 1466

Bakery products

- bakery mixes, developments in 1541
- developments in bakery products 1539

Bananas

- composition NMR determination of ripening bananas 1527
- ripeness evaluation in banana 1526
- ripening & composition of bananas 1527

Beef

- bacteriocins & *Listeria monocytogenes* in beef 1566
- cattle carcasses, bacteria anaerobic determination on 1563
- lactic acid & *Listeria monocytogenes* in beef 1566
- Listeria monocytogenes* growth modelling on beef 1565
- slaughterhouses size & bacteria in beef 1564

Beer

- humulene epoxides hydrolysis products in beer 1620

Beverages

- developments in beverages 1589
- flavonoids anticarcinogenic in beverages 1588
- fruits tropical use in beverages 1592

Biomass

Rhizopus oligosporus biomass,
fermentation solid state
modelling for 1476

Bioreactors

silicone oils microencapsulated &
O₂ in bioreactors 1601

Biosensors

Pseudomonas pseudoflava
fermentation broths, Zymomonas
mobilis glucose fructose
oxidoreductases biosensors
monitoring of 1481

Biotechnology

foods, biotechnology & pricing
United States of America of 1482
olive oil mills effluents, fungi
bioremediation of 1607

Bleaching

olive oils, bentonites H₂SO₄
treated & bleaching of 1606
rapeseed oils, press effect &
bleaching of 1611

Breakfast cereals

development of breakfast cereals
1491

Breaking

brown rice, breaking behaviour of
long grain 1492

Broilers

geriforte & carcass
characteristics/meat quality of
broilers 1577

By products

chickens, by products yield from
1575
soy industry, by products
properties of 1507

Capsicums

capsaicin, Capsicum annum
peroxidases oxidation of 1618

Carbon

activated carbon formation from
fruits wastes 1521

Carcasses

broilers, geriforte & carcass
characteristics of 1577
carcass traits/meat quality of
goat & castration/slaughter wt.
1567
cattle carcasses, bacteria
anaerobic determination on 1563
swine carcasses, slaughter &
enterococci in 1570

Carcinogenicity

beverages, flavonoids

anticarcinogenic in 1588

Carotenoids

sweet potato leaves, cooking
microwaves & chlorophylls
composition of 1514

Cattle

heating & diazepam residues in
cattle livers 1562

Cereal products

breakfast cereals, 5
(hydroxymethyl) 2 furaldehyde
HPLC determination in 1490
breakfast cereals, developments
in 1491

Cereals

acha proteins, properties of 1489

Chapaties

soy fortified chapaties,
microbial quality of 1542

Cheese

cycloplazonic acid ELISA
detection in cheese 1448
domlati cheese manufacture, salt
& pollution control during 1552
pouches for microwaveable cheese
toppings 1551

Cherries

tart cherries, anthocyanins
extraction from 1529

Chickens

irradiation & o tyrosine in
chicken meat 1576
meat/byproduct yield from
chickens 1575

Chips

potato chips, quality of 1513

Chlorophylls

rapeseed oils, chlorophylls
degradation products & stability
of 1609
rapeseed oils, processing &
chlorophylls in 1610
sweet potato leaves, cooking
microwaves & chlorophylls
composition of 1514

Chocolates

fat bloom in chocolates 1535

Cholesterol

eggs, feed PD 123244 15 &
cholesterol in 1579
food proteins quillaja saponins
complexes, cholesterol effects
of 1624
heating & oxidation of
cholesterol 1625

Cloning vectors

Lactococcus lactis, cloning
vectors stability in 1464

Cocoa beans

organic acids in cocoa beans 1446

Colorants

foods, cochineal TLC detection in
1447

Colour

fruit products, colour
deterioration in packed
processed 1519

Concentration

fruit juices, membrane processing
& concn. of 1591

Condiments

development of new condiment
products 1617

Confectionery

fat bloom in confectionery 1535

Convenience foods

fruit/vegetable based technology
for defence service convenience
foods 1434

Cooking

poultry products, end cooking
temp. ELISA determination for
1573

sweet potato leaves, cooking
microwaves & carotenoids
composition of 1514
sweet potato leaves, cooking
microwaves & chlorophylls
composition of 1514

Crustacea

crawfish, storage temp. &
Listeria monocytogenes in 1585

Cultivation

Agaricus bisporus, cultivation
casings polyacrylamide gel &
residual acrylamide monomers in
1474

Curry

gravy base for meat curry 1558

Dairies

lecithin in dairy industries 1544

Dairy products

developments in dairy products
1547

Dairying

prospects of dairying in Punjab
1546

Density

fatty acids, density
determination of 1599
vegetable oils, density
determination of 1599

Desserts

developments in desserts 1550

Dhals

development/storage stability of instant dhals 1500

Diseases

apples, bitter pit development in 1525

Dough

Bacillus subtilis proteinases
sulphites substitutes for
conditioning dough 1458

Downstream processing

lactic acid, *Lactobacillus*
delbreuckii fermentation broths
downstream processing for 1449

Dried foods

bakery mixes, developments in 1541

Driers

Eryngium foetium, driers for 1436

Drugs

cattle livers, heating & diazepam
residues in 1562

Drying

Eryngium foetium, drying of herb
1436

Dyes

azo dyes, technological aspects
of 1486

Economics

processed foods, economics
recession & development of 1431

Egg whites

antimicrobial compounds &
stability of egg white lysozymes
1580

fatty N acylamino acids &
functional properties of egg
whites 1627 1627

fatty acids & *Escherichia coli*
inhibition by egg whites
lysozymes 1453

storage & stability of egg white
lysozymes 1580

Eggs

Salmonella enteritidis detection
in eggs 1581

feed PD 123244 15 & cholesterol
in eggs 1579

feed PD 123244 15 & composition
of eggs 1579

Emulsions

interfacial properties of milk
proteins stabilized emulsions
1555

Enzymes

Escherichia coli, firefly
luciferases gene expression in
1485

potato starch wastes *Trichoderma*
reesei fermentation for enzymes
1512

soybeans, hydrolysis enzymic &
oils extraction from 1616

Equipments

packaging equipment for foods 1438
turkeys, pop up timers in 1578

Escherichia

Bacillus cereus β amylases
gene expression in *Escherichia*
coli 1456

egg whites lysozymes, fatty acids
& *Escherichia coli* inhibition by
1453

foods, *Escherichia coli* control
in 1460

viability determination online of
Escherichia coli 1485

Escherichia coli

firefly luciferases gene
expression in *Escherichia coli*
1485

Essential oils

hop essential oils, humulene
epoxides hydrolysis products in
1620

Esterification

vegetable oils, lipases
interesterification & properties
of blended 1600

Ethanol

potato starch wastes *Pachysolen*
tannophilus fermentation for
ethanol 1512

whey *Kluyveromyces marxianus*
fermentation for ethanol 1483

yeast strain development for
ethanol production 1477

Zymomonas mobilis, fermentation
conditions & ethanol production
using 1480

Ethylene

apples, ethylene absorbents in
packed stored 1523

Extraction

carbohydrases & oils extraction
from rapeseeds 1612

kidney bean proteins, extraction
& solubility of 1502

lulo peel, hotrienol precursors
extraction from 1516

soybeans, hydrolysis enzymic &

oils extraction from 1616
supercritical fluid extraction
technology in India 1445
tart cherries, anthocyanins
extraction from 1529

Faba beans

tannins condensed &
antinutritional factors in faba
beans 1501

Fats

chocolates/confectionery, fat
bloom in 1535

Fatty acids

density determination of fatty
acids 1599

egg whites lysozymes, fatty acids
& *Escherichia coli* inhibition by
1453

egg whites, fatty N acylamino
acids & functional properties of
1627

whey protein isolates, fatty N
acylamino acids & functional
properties of 1627

Feeds

eggs, feed PD 123244 15 &
cholesterol in 1579

eggs, feed PD 123244 15 &
composition of 1579

Fermentation

wheat mash, backset & yeasts
fermentation of 1495

Zymomonas mobilis, fermentation
conditions & ethanol production
using 1480

Fermentation products

ethanol, potato starch wastes
Pachysolen tannophilus
fermentation for 1512
ethanol, whey *Kluyveromyces*
marxianus fermentation for 1483
galactosides, lactose β
galactosidases hydrolysis for
1451

γ linolenic acid, *Mucor*
fermentation for 1598

Fermentation technology

Corynebacterium glutamicum,
fluorescence monitoring online
of 1459

Escherichia coli, viability
determination online of 1485

Pseudomonas pseudoflava
fermentation broths, *Zymomonas*
mobilis glucose fructose
oxidoreductases biosensors

- monitoring of 1481
- Rhizopus oligosporus* biomass, fermentation solid state modelling for 1476
- Filter aids**
- olive oils, bentonites H_2SO_4 treated & bleaching of 1606
- Fish products**
- developments in fish products 1571
- Flavonoids**
- beverages, flavonoids anticarcinogenic in 1588
- Flavour**
- groundnut oils peanut meal mixtures, roasting gases & flavour formation in roasted 1603
- Flavour compounds**
- capsaicin, *Capsicum annuum* peroxidases oxidation of 1618
- cashew apples flavour compounds, antimicrobial activity of 1504
- lulo peel, hotrienol precursors extraction from 1516
- tea flavour compounds, indoles & *Streptococcus mutans* inhibition by green 1596
- Flavourings**
- foods, flavour systems for 1487
- Fluorescence**
- Corynebacterium glutamicum*, fluorescence monitoring online of 1459
- Food safety**
- Agaricus bisporus*, cultivation casings polyacrylamide gel & residual acrylamide monomers in 1474
- beef, *Listeria monocytogenes* growth modelling on 1565
- beef, bacteriocins & *Listeria monocytogenes* in 1566
- beef, slaughterhouses size & bacteria in 1564
- beverages, flavonoids anticarcinogenic in 1588
- cattle carcasses, bacteria anaerobic determination on 1563
- cattle livers, heating & diazepam residues in 1562
- crawfish, storage temp. & *Listeria monocytogenes* in 1585
- edible fungi, 137Cs in 1475
- eggs, *Salmonella enteritidis* detection in 1581
- Escherichia coli* control in foods 1460
- foods, *Shigella flexneri* in Bangladesh 1469
- foods, microorganisms control in 1465
- fungi, cycloplazonic acid synthesis ELISA detection by 1448
- lactic acid bacteria bacteriocins, bacteria Gram negative inhibition by 1454
- lamb livers, microorganisms excision surface sampling determination in 1568
- L histidine nitrites reaction products, mutagenicity of 1622
- Listeria innocua*, genetics of tetracyclines resistant 1467
- meat products, *Listeria* in South Africa 1559
- meat, pH & bacteria in 1560
- mussels, domoic acid & amnesic shellfish poisoning from 1582
- poultry, *Salmonella* control in 1572
- sausages, enterococci in 1570
- Frozen foods**
- development of frozen foods 1444
- peas, var. & characteristics/quality of frozen 1503
- quick frozen food industries 1442
- Fruit juices**
- membrane processing & concn. of fruit juices 1591
- raspberry juices, phenols composition of 1595
- tart cherries, anthocyanins extraction from 1529
- Fruit products**
- colour deterioration in packed processed fruit products 1519
- developments in fruit products 1522
- Fruits**
- activated carbon formation from fruit wastes 1521
- beverages, fruits tropical use in 1592
- cashew apples flavour compounds, antimicrobial activity of 1504
- composition NMR determination of fruits 1520
- convenience foods, fruit based technology for defence services 1434
- lulo peel, hotrienol precursors extraction from 1516
- processed foods, fruits tropical use in 1592
- Frying**
- reuse of frying oils 1602
- Fungi**
- cycloplazonic acid synthesis ELISA detection by fungi 1448
- growth estimation methods comparison for fungi 1471
- olive oil mills effluents, fungi bioremediation of 1607
- Schizosaccharomyces pombe*, metabolism of 1478
- Fungi edible**
- Agaricus bisporus*, cultivation casings polyacrylamide gel & residual acrylamide monomers in 1474
- edible fungi, 137Cs in 1475
- Furans**
- breakfast cereals, 5 (hydroxymethyl) 2 furaldehyde HPLC determination in 1490
- Galactosidases**
- galactosides, lactose β galactosidases hydrolysis for 1451
- Gas chromatography**
- olive oils, alkanols gc determination in 1605
- Gelation**
- β lactoglobulin, protein engineering & gelation properties of bovine 1621
- bovine serum albumin, α lactalbumin & gelation properties of 1626
- Gene expression**
- Escherichia coli*, viability determination online of 1485
- amino acids sequence of *Bacillus cereus* β amylases 1456
- Genetic techniques**
- Lactococcus*, genetic engineering of 1461
- Genetics**
- Listeria innocua*, genetics of tetracyclines resistant 1467
- Ghee**
- recombined milk prepared with ghee 1549
- Gibberellic acid**
- millet, gibberellic acid & malting properties of 1496
- Glycosidases**
- 1,4 β D xylan xylanohydrolases, *Bacillus*

- polymyx synthesis of 1457
- carbohydrases & oils extraction from rapeseeds 1612
- egg white lysozymes, antimicrobial compounds & stability of 1580
- egg white lysozymes, storage & stability of 1580
- egg whites lysozymes, fatty acids & *Escherichia coli* inhibition by 1453
- Streptomyces thermoviolaceus* chitinases, properties of 1470
- Glycosides**
- food proteins quillaja saponins complexes, cholesterol effects of 1624
- galactosides, lactose β galactosidases hydrolysis for 1451
- Goat**
- carcass traits/meat quality of goat & castration/slaughter wt. 1567
- Grapefruits**
- temp. conditioning/surface treatments of grapefruits 1530
- Gravy**
- meat curry, gravy base for 1558
- Groundnut flour**
- groundnut oils peanut meal mixtures, roasting gases & composition of roasted 1603
- Groundnut oils**
- roasting gases & composition of roasted groundnut oils peanut meal mixtures 1603
- roasting gases & flavour formation in roasted groundnut oils peanut meal mixtures 1603
- Groundnuts**
- groundnut oils peanut meal mixtures, roasting gases & flavour formation in roasted 1603
- metolachlor residues in groundnuts 1505
- Heat**
- liquid foods, sp. heat of 1440
- Heating**
- α lactalbumin, heating & structure of 1556
- β lactoglobulin, heating & structure of 1556
- cattle livers, heating & diazepam residues in 1562
- cholesterol, heating & oxidation of 1625
- soybean oils, heating & linolenic acid in 1615
- starfruit honey, microwave heating & storage/properties of 1528
- Heterocyclic compounds**
- tea flavour compounds, indoles & *Streptococcus mutans* inhibition by green 1596
- High performance liquid chromatography**
- breakfast cereals, 5 (hydroxymethyl) 2 furaldehyde HPLC determination in 1490
- rapeseeds, cv. HPLC determination of 1608
- Hops**
- humulene epoxides hydrolysis products in hop essential oils 1620
- Hormones**
- foods, hormone residues in 1557
- Hydrocarbons**
- biogas, ensilage & mango peel fermentation for 1484
- biogas, vinasses microorganisms fermentation for 1590
- Hydrolases**
- Aspergillus* aminoacylases, L phenylalanine synthesis by immobilized 1450
- cattle livers, heating & diazepam residues in 1472
- Immobilization**
- pectin lyases, immobilization of 1452
- protein glutamine gamma glutamyltransferases, immobilization & properties of 1623
- Immobilized enzymes**
- Aspergillus* aminoacylases, L phenylalanine synthesis by immobilized 1450
- Aspergillus* aminoacylases, properties of immobilized 1472
- Immunological techniques**
- fungi, cycloplazonic acid synthesis ELISA detection by 1448
- poultry products, end cooking temp. ELISA determination for 1573
- Industries**
- agro industries, quality problems in 1427
- food industry, robotics use in 1443
- Infant foods**
- developments in infant foods 1587
- Inhibition**
- cashew apples flavour compounds, antimicrobial activity of 1504
- egg whites lysozymes, fatty acids & *Escherichia coli* inhibition by 1453
- lactic acid bacteria bacteriocins, bacteria Gram negative inhibition by 1454
- shrimps, microorganisms spoilage glucose oxidases catalases inhibition from 1584
- tea flavour compounds, indoles & *Streptococcus mutans* inhibition by green 1596
- Instant foods**
- bakery mixes, developments in 1541
- dhals, storage stability of instant 1500
- Ions**
- rice bran oils, lipases metal ions inhibition & quality of 1614
- Irradiation**
- chicken meat, irradiation & o tyrosine in 1576
- safflower oilcakes, irradiation & nutritional values in 1506
- Jaggery**
- screening sugarcane var. for quality jaggery 1537
- sweet sorghum, jaggery from 1498
- Kidney beans**
- proteins, extraction & solubility of kidney bean 1502
- proteins, solubility of kidney bean 1502
- Kinnow mandarin orange**
- storage/processing of kinnow mandarin orange 1531
- Kinnow mandarin orange juices**
- juices/nectar, blending kinnow mandarin juice on quality of 1593
- Kluyveromyces**
- ethanol, whey *Kluyveromyces marxianus* fermentation for 1483
- Lactalbumins**
- bovine serum albumin, α lactalbumin & gelation properties of 1626
- heating & structure of α lactalbumin 1556

Lactic acid

- Lactobacillus delbreuckii fermentation broths downstream processing for lactic acid 1449
- beef, bacteriocins & Listeria monocytogenes in 1566
- beef, lactic acid & Listeria monocytogenes in 1566
- lactic acid, Lactobacillus delbreuckii fermentation broths downstream processing for 1449

Lactobacillus

- lactic acid, Lactobacillus delbreuckii fermentation broths downstream processing for 1449

Lactococcus

- bacteriophages resistance maintenance of Lactococcus lactis 1463
- cloning vectors stability in Lactococcus lactis 1464
- genetic engineering of Lactococcus 1461
- sugars uptake in Lactococcus lactis 1462

Lactoglobulins

- heating & structure of β lactoglobulin 1556
- protein engineering & gelation properties of bovine β lactoglobulin 1621

Lactose

- galactosides, lactose β galactosidases hydrolysis for 1451

Lamb

- microorganisms excision surface sampling determination in lamb livers 1568

Laser

- wheat flour, particle size measurement laser instrument in 1493

Lecithin

- dairy industries, lecithin in 1544

Legumes

- proteins, solubility spectroscopic measurement of grain legume 1499

Linolenic acid

- Mucor fermentation for γ linolenic acid 1598
- soybean oils, heating & linolenic acid in 1615

Linseeds

- antinutritional factors in

linseeds 1604

composition of linseeds 1604

Lipases

- organic solvents & hydrolysis modelling by lipases 1597
- rice bran oils, lipases metal ions inhibition & quality of 1614
- vegetable oils, lipases interesterification & properties of blended 1600

Liquid foods

- sp. heat of liquid foods 1440

Listeria

- beef, Listeria monocytogenes growth modelling on 1565
- beef, bacteriocins & Listeria monocytogenes in 1566
- crawfish, storage temp. & Listeria monocytogenes in 1585
- genetics of tetracyclines resistant Listeria innocua 1467
- meat products, Listeria in South Africa 1559
- typing of Listeria bacteriophages 1466

Livers

- cattle livers, heating & diazepam residues in 1562
- lamb livers, microorganisms excision surface sampling determination in 1568

Malting

- millet, gibberellic acid & malting properties of 1496
- sorghum, gibberellic acid & malting properties of 1496

Maltose

- potato starch simultaneous saccharification separation for maltose 1536

Mango juices

- packaging flexible of mango juices 1594

Mangoes

- biogas, ensilage & mango peel fermentation for 1484
- physico chemical characteristics of mangoes 1518

Marketing

- milk in Punjab, economics of marketing 1548

Mashing

- wheat mashes, backset & yeasts fermentation of 1495

Meals

- entrees, developments in 1430

Meat

- Penicillin residues detection in meat 1561
- pH & bacteria in meat 1560
- pH & biogenic amines formation in meat 1560

Meat products

- Listeria in South African meat products 1559
- developments in meat products 1571
- meat products, Listeria in South African 1559

Mechanically deboned poultry meat

- quality/utilization of mechanically deboned poultry meat 1574

Membrane

- fruit juices, membrane processing & concn. of 1591

Metolachlor

- foods, metolachlor residues in 1505

Microbiological techniques

- fungi, growth estimation methods comparison for 1471
- lamb livers, microorganisms excision surface sampling determination in 1568

Microorganisms

- biogas, vinasses microorganisms fermentation for 1590
- cashew apples flavour compounds, antimicrobial activity of 1504
- chapatties, microbial quality of soy fortified 1542
- foods, microorganisms control in 1465
- lamb livers, microorganisms excision surface sampling determination in 1568
- sapota, chemical treatment & microbial control of 1532
- shrimps, microorganisms spoilage glucose oxidases catalases inhibition from 1584

Microwaves

- starfruit honey, microwave heating & storage/properties of 1528
- sweet potato leaves, cooking microwaves & chlorophylls composition of 1514

Milk

- economics of marketing milk in Punjab 1548
- ghee, recombined milk prepared

- with 1549
productivity improvement at
Kolhapur milk union 1545
- Milk products**
Leben in Salah Al ddl, properties
of 1553
- Millet**
glibberellic acid & malting
properties of millet 1496
- Minerals**
rice bran oils, lipases metal
ions inhibition & quality of 1614
- Mucor**
gamma linolenic acid, Mucor
fermentation for 1598
- Mushroom**
Pleurotus djamor a new edible
mushroom 1473
- Mussels**
domoic acid & amnesic shellfish
poisoning from mussels, Review
1582
- Mutagenicity**
L histidine nitrites reaction
products, mutagenicity of 1622
- Mutton**
carcass traits/meat quality of
goat & castration/slaughter wt.
1567
- Mycotoxins**
cheese, cycloplazonic acid ELISA
detection in 1448
fungi, cycloplazonic acid
synthesis ELISA detection by 1448
- Nectar**
blending kinnow mandarin juice on
quality of nectar 1593
- Nitrites**
L histidine nitrites reaction
products, mutagenicity of 1622
- Nuclear magnetic resonance**
bananas, composition NMR
determination of ripening 1527
fruits, composition NMR
determination of 1520
- Nutritional values**
leaf protein isolates,
nutritional values of aquatic
1517
safflower oilcakes, irradiation &
nutritional values in 1506
- Occupational hazards**
food industry, occupational
hazards in 1433
- Ochratoxins**
pearl millet, Asp. ochraceus
toxin production &
susceptibility of 1497
- Oils**
bioreactors, silicone oils
microencapsulated & O₂ in 1601
frying oils, reuse of 1602
vegetable oils, density
determination of 1599
vegetable oils, lipases
interesterification & properties
of blended 1600
- Oilseeds**
safflower oilcakes, irradiation &
nutritional values in 1506
- Olive oils**
alkanols GC determination in
olive oils 1605
bentonites H₂SO₄ treated &
bleaching of olive oils 1606
fungi bioremediation of olive oil
mills effluents 1607
- Onions**
metolachlor residues in onions
1505
storage/sprouting & properties of
onion cvs 1508
- Oranges**
physico chemical characteristics
of oranges 1518
- Organic nitrogen compounds**
tea flavour compounds, indoles &
Streptococcus mutans inhibition
by green 1596
- Oxidases**
shrimps, microorganisms spoilage
glucose oxidases catalases
inhibition from 1584
- Oxidation**
capsaicin, Capsicum annuum
peroxidases oxidation of 1618
cholesterol, heating & oxidation
of 1625
- Oxidoreductases**
Pseudomonas pseudoflava
fermentation broths, Zymomonas
mobilis glucose fructose
oxidoreductases biosensors
monitoring of 1481
- Oxygen**
bioreactors, silicone oils
microencapsulated & O₂ in 1601
- Packaging**
apples, ethylene absorbents in
packed stored 1523
foods, packaging equipment for
1438
foods, packaging recycling from
1439
- Packaging materials**
fruit products, colour
deterioration in packed
processed 1519
mango juices, packaging
flexible materials for packing
1594
- Packs**
foods, packs for 1437
- Pearl millet**
Asp. ochraceus toxin production &
susceptibility of pearl millet
1497
- Peas**
var. & characteristics/quality of
frozen peas 1503
- Pectic enzymes**
pectin lyases, immobilization of
1452
- Peel**
blogas, ensilage & mango peel
fermentation for 1484
lulo peel, hotrienol precursors
extraction from 1516
- Peroxidases**
capsaicin, Capsicum annuum
peroxidases oxidation of 1618
shrimps, microorganisms spoilage
glucose oxidases catalases
inhibition from 1584
- Phenolases**
potato monophenol
monooxygenases,
properties of 1510 1511
- Phenols**
raspberry juices, phenols
composition of 1595
- Physical properties**
emulsions, interfacial properties
of milk proteins stabilized 1555
- Pineapples**
physico chemical characteristics
of pineapples 1518
- Plastics**
Agaricus bisporus, cultivation
casings polyacrylamide gel &
residual acrylamide monomers in
1474
- Plum**
physico chemical characteristics
of plum 1518
- Poisoning**
mussels, domoic acid & amnesic
shellfish poisoning from, Review
1582

Pollution

domaiti cheese manufacture, salt & pollution control during 1552

Polymers

food technology, polymers in 1441

Pork

swine carcasses, slaughter & enterococci in 1570

volatile compounds composition of cured vs. uncured pork 1569

Potato chips

quality of potato chips 1513

Potatoes

production/price behaviour of Meghalaya potatoes 1509

properties of potato monophenol monooxygenases 1510 1511

purification of potato monophenol monooxygenases 1511

Pouches

cheese toppings, pouches for microwaveable 1551

Poultry

chicken meat, irradiation & o tyrosine in 1576

end cooking temp. ELISA, determination for poultry products 1573

quality/utilization by Indian meat industry of mechanically deboned poultry meat 1574

Salmonella control in poultry 1572

Pricing

foods, biotechnology & pricing United States of America of 1482

Processed foods

aspects of processed foods 1428

developments in healthy processed foods 1586

developments in processed foods 1432

economics recession & development of processed foods 1431

fruits tropical use in processed foods 1592

side dishes, developments in 1543

Processing

food processing, extraneous matter in 1435

kinnow mandarin orange, processing of 1531

rapeseed oils, processing & chlorophylls in 1610

rice bran oils, composition & processing of 1613

sea urchin gonads, processing &

vitamin B group in 1583

Protein engineering

β lactoglobulin, protein engineering & gelation properties of bovine 1621

Proteinases

aspartame precursors, Pseudomonas

aeruginosa elastases synthesis of 1468

dough, Bacillus subtilis

proteinases sulphites

substitutes for conditioning 1458

food proteins, organic solvents & papain hydrolysis of 1628

Proteins

food proteins quillaja saponins complexes, cholesterol effects of 1624

food proteins, organic solvents & papain hydrolysis of 1628

food proteins, quillaja saponins interactions with 1624

legume proteins, solubility spectroscopic measurement of grain 1499

Proteins cereal

acha proteins, properties of 1489

wheat, protein isolates

properties of proteins high 1494

Proteins milk

egg whites, fatty N acylamino acids & functional properties of 1627

emulsions, interfacial properties of milk proteins stabilized 1555

Proteins vegetable

kidney bean proteins, extraction & solubility of 1502

leaf protein isolates, nutritional values of aquatic 1517

Pseudomonas

aspartame precursors, Pseudomonas

aeruginosa elastases synthesis of 1468

Zymomonas mobilis glucose

fructose oxidoreductases

biosensors monitoring of

Pseudomonas pseudoflava

fermentation broths 1481

Purification

potato monophenol monooxygenases,

purification of 1511

Quality

agro industries, quality problems in 1427

Radioelements

edible fungi, 137Cs in 1475

Rapeseed oils

chlorophylls degradation products

& stability of rapeseed oils 1609

press effect & bleaching of rapeseed oils 1611

processing & chlorophylls in rapeseed oils 1610

rapeseeds, carbohydrases & oils extraction from 1612

Rapeseeds

carbohydrases & oils extraction from rapeseeds 1612

cv. HPLC determination of rapeseeds 1608

Recycling

foods, packaging recycling from 1439

Residues

foods, hormone residues in 1557

foods, metolachlor residues in 1505

Rheology

foods, rheological tests on 1619

Rhizopus

fermentation solid state

modelling for Rhizopus

oligosporus biomass 1476

Rice

brown rice, breaking behaviour of long grain 1492

Rice bran oils

composition & processing of rice bran oils 1613

lipases metal ions inhibition & quality of rice bran oils 1614

viscosity & processing of rice bran oils 1613

Ripening

banana, ripeness evaluation in 1526

bananas, ripening & composition of 1527

Roasted foods

groundnut oils peanut meal

mixtures, roasting gases &

flavour formation in roasted 1603

Roasting

groundnut oils peanut meal

mixtures, roasting gases &

flavour formation in roasted 1603

Saccharification

maltose, potato starch

- simultaneous saccharification
separation for 1536
- Salmonella**
beef, slaughterhouses size &
Salmonella in 1564
eggs, Salmonella enteritidis
detection in 1581
poultry, Salmonella control in
1572
- Salt**
wheys, salt & citric acid
production in 1552
- Sapota**
chemical treatment & microbial
control of sapota 1532
- Sausages**
enterococci in sausages 1570
- Schizosaccharomyces pombe**
Schizosaccharomyces pombe,
metabolism of 1478
- Sea foods**
sea urchin gonads, processing &
vitamin B group in 1583
sea urchin gonads, storage &
vitamin B group in 1583 1583
- Separation**
maltose, potato starch
simultaneous saccharification
separation for 1536
- Shado beni**
drying of herb Eryngium foetium
1436
- Shigella**
foods, Shigella flexneri in
Bangladesh 1469
- Shrimps**
microorganisms spoilage glucose
oxidases catalases inhibition
from shrimps 1584
- Slaughter**
carcass traits/meat quality of
goat & castration/slaughter wt.
1567
swine carcasses, slaughter &
enterococci in 1570
- Slaughterhouses**
beef, slaughterhouses size &
bacteria in 1564
- Snack foods**
developments in snack foods 1540
- Solar dryers**
Eryngium foetium, solar driers
for 1436
- Solubility**
kidney bean proteins, extraction
& solubility of 1502
- Solvents**
bacteria, organic solvents
toxicity in 1455
food proteins, organic solvents &
papain hydrolysis of 1628
lipases, organic solvents &
hydrolysis modelling by 1597
- Sorghum**
gibberellic acid & malting
properties of sorghum 1496
- Soups**
developments in soups 1429
vegetable soups, preparation of
mixed 1515
- Soybean oils**
heating & linolenic acid in
soybean oils 1615
soybeans, hydrolysis enzymic &
oils extraction from 1616
- Soybeans**
by products properties of soy
industries 1507
chapatties, microbial quality of
soy fortified 1542
hydrolysis enzymic & oils
extraction from soybeans 1616
metolachlor residues in soybeans
1505
- Spectroscopy**
legume proteins, solubility
spectroscopic measurement of
grain 1499
- Sprouting**
onion cvs, sprouting & properties
of 1508
- Stability**
egg white lysozymes,
antimicrobial compounds &
stability of 1580
egg white lysozymes, storage &
stability of 1580
Lactococcus lactis, cloning
vectors stability in 1464
rapeseed oils, chlorophylls
degradation products & stability
of 1609
tart cherries, anthocyanins
extraction from 1529
- Standards**
ISO 9000 1629
- Starches**
enzymes, potato starch wastes
Trichoderma reesei fermentation
for 1512
ethanol, potato starch wastes
Pachysolen tannophilus
fermentation for 1512
maltose, potato starch
simultaneous saccharification
separation for 1536
- Starfruit**
honey, microwave heating &
storage/properties of starfruit
1528
- Storage**
apples, ethylene absorbents in
packed stored 1523
crawfish, storage temp. &
Listeria monocytogenes in 1585
dhals, storage stability of
instant 1500
egg white lysozymes, storage &
stability of 1580
extraneous matter in storage 1435
jaggery, screening sugarcane var.
for quality 1537
sea urchin gonads, storage &
vitamin B group in 1583
tart cherries, anthocyanins
extraction from 1529
- Storage controlled atmospheres**
apples cvs, storage controlled
atm. & quality of 1524
- Storage fruits**
kinnow mandarin orange, storage
of 1531
starfruit honey, microwave
heating & storage of 1528
- Storage vegetables**
onion cvs, storage ambient &
properties of 1508
- Streptococcus**
indoles & Streptococcus mutans
inhibition by green tea flavour
compounds 1596
- Sugar confectionery**
almonds use in sugar
confectionery 1534
developments in sugar
confectionery 1533
- Sugarcane**
post harvest deterioration in
wt./juice quality of cane var.
1538
screening sugarcane var. for
quality jaggery/storability 1537
- Sugars**
lactococcus lactis, sugars uptake
in 1462
- Sulphites**
dough, Bacillus subtilis
proteinases sulphites

- substitutes for conditioning 1458
- Sweet sorghum**
jaggery/ syrup from sweet sorghum 1498
- Syrup**
sweet sorghum, syrup from 1498
- Tannins**
faba beans, tannins condensed & antinutritional factors in 1501
- Terpenoids**
beer, humulene epoxides
hydrolysis products in 1620
lulo peel, hotrienol precursors
extraction from 1516
- Thin layer chromatography**
foods, cochineal TLC detection in 1447
- Toppings**
cheese toppings, pouches for microwaveable 1551
dessert toppings, developments in 1550
- Toxicity**
bacteria, organic solvents
toxicity in 1455
- Toxins**
mussels, domoic acid & amnesic
shellfish poisoning from, Review 1582
- Transferases**
protein glutamine gamma
glutamyltransferases,
immobilization & properties of 1623
- Trichoderma**
ethanol, potato starch wastes
Pachysolen tannophilus
fermentation for 1512
- Turkeys**
pop up timers in turkeys 1578
- Tyrosine**
chicken meat, irradiation & o
tyrosine in 1576
- Vegetable products**
developments in vegetable
products 1522
- Vegetables**
convenience foods, vegetable
based technology for defence
services 1434
soups, preparation of mixed
vegetable 1515
sweet potato leaves, cooking
microwaves & chlorophylls
composition of 1514
- Viscosity**
rice bran oils, viscosity &
processing of 1613
- Vitamin b**
sea urchin gonads, processing &
vitamin B group in 1583
- Volatile compounds**
pork, volatile compounds
composition of cured vs. uncured 1569
- Waste water**
biogas, vinasses microorganisms
fermentation for 1590
olive oil mills effluents, fungi
bioremediation of 1607
- Wastes**
biogas, ensilage & mango peel
fermentation for 1484
ethanol, potato starch wastes
Pachysolen tannophilus
fermentation for 1512
fruit wastes, activated carbon
formation from 1521
- Wheat**
backset & yeasts fermentation of
wheat mashes 1495
protein isolates properties of
proteins high wheat 1494
- Wheat flour**
particle size measurement laser
instrument in wheat flour 1493
- Wheys**
bakers yeast, whey as alternative
substrate for 1554
ethanol, whey Kluyveromyces
marxianus fermentation for 1483
fatty N acylamino acids &
functional properties of whey
protein isolates 1627
salt & citric acid production in
wheys 1552
- Xanthan**
structure/properties/uses of
xanthan 1488
- Yeast baker's**
whey as alternative substrate for
baker's yeast 1554
- Yeasts**
ethanol production, yeast strain
development for 1477
ethanol, potato starch wastes
Pachysolen tannophilus
fermentation for 1512
foods, Zygosaccharomyces bailii
detection in acidic 1479
wheat mashes, backset & yeasts
fermentation of 1495
- Zymomonas mobilis**
fermentation conditions & ethanol
production using Z. mobilis 1480

**NATIONAL INFORMATION CENTRE FOR FOOD SCIENCE AND TECHNOLOGY
CFTRI, MYSORE - 570 013**

Also subscribe to our other periodicals

1. FOOD PATENTS (Quarterly)

Gives world patent information on Food Science and Technology taken from national and international sources

Annl Subn: Indian Rs. 200/- Foreign US \$. 70/-

2. FOOD DIGEST (Quarterly)

This is oriented towards the information needs of food industries, trade and marketing personnel, entrepreneurs, decision makers and individuals engaged in food field.

Annl Subn: Indian Rs. 200/- Foreign US \$. 70/-

For details, please write to:

The Head

FOSTIS, CFTRI

Mysore - 570 013, India

COMPUTERISED DATABASE SEARCH OF WORLD FOOD LITERATURE

The National Information Centre for Food Science and Technology (NICFOS) at CFTRI, Mysore, has developed facilities for computerised "Database Search" of the world literature in Food Science and Technology and related disciplines. Retrospective search-service facility extending upto about 20 years is available on nominal payment basis. Titles alone or with abstracts can be requisitioned as per the needs of the intending users.

For details, please write to:

The Head

FOSTIS, CFTRI

Mysore - 570 013, India

Regd. No. 36729/84